# DOCUMENT RESUME

ED 126 049 95 SP 010 245

| | |
|---|---|
| AUTHOR | Hein, William H., Jr., Ed. |
| TITLE | A Laboratory Facility Dedicated to Educational R&D, Volume 1. |
| INSTITUTION | Southwest Regional Laboratory for Educational Research and Development, Los Alamitos, Calif. |
| SPONS AGENCY | National Inst. of Education (DHEW), Washington, D.C. |
| PUB DATE | 75 |
| CONTRACT | NE-0-00-3-0064 |
| NOTE | 174p.; For related documents, see SP 010 246 and 247 |
| EDRS PRICE | MF-$0.83 HC-$8.69 Plus Postage. |
| DESCRIPTORS | Bids; Building Plans; Construction (Process); *Documentation; *Educational Development; *Educational Research; *Facility Planning; Federal Aid; Grants; Guidelines; *Laboratories; Maintenance; Management Systems; *Program Planning; Technical Writing |

ABSTRACT

This volume contains working papers that document the planning, constructing, equipping, and operating of a laboratory facility dedicated to educational research and development (R&D). There are three volumes in the complete set. Volume 1 contains the technical substance of activity and sets forth the technical substance of the twelve working papers. Working Paper 1 describes the process followed by the Southwest Regional Laboratory (SWRL) for R&D in planning the new facility and the planning principles that were developed. The process followed in obtaining approval of the grant application is discussed in Working Paper 2. Working Paper 3 sets forth the procedures followed in selecting the contractors and establishing their fees, while Working Paper 4 reports SWRL's experience in applying the principles of construction management and fast tracking. The process used by the construction manager in estimating costs in establishing a construction budget is treated in Working Paper 5. Working Papers 6 and 7 indicate the nature of documentation that should be prepared by the grantee of an experimental construction project to insure a fair and accurate compliance to federal audit. SWRL's documented experience in consolidating and moving its operations to the new facility is contained in Working Paper 8, while the planning and activities for the building dedication ceremonies are described in Working Paper 9. Working Paper 10 describes the operations studies in the area of custodial and grounds maintenance services. The results of an operational study are included in Working Paper 11. Working Paper 12 discusses certain aspects of the R&D equipment and systems acquired under the grant. (SK)

Documents acquired by ERIC include many informal unpublished materials not available from other sources. ERIC makes every effort to obtain the best copy available. Nevertheless, items of marginal reproducibility are often encountered and this affects the quality of the microfiche and hardcopy reproductions ERIC makes available via the ERIC Document Reproduction Service (EDRS). EDRS is not responsible for the quality of the original document. Reproductions supplied by EDRS are the best that can be made from the original.

ED126049

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SWRL

SWRL EDUCATIONAL RESEARCH AND DEVELOPMENT

2

# A LABORATORY FACILITY DEDICATED TO EDUCATIONAL R&D VOLUME I

SWRL Working Papers 1975

This document has been distributed to a limited audience for a limited purpose. It is not published. Copies may be [redacted] SWRL Educational Research and Development, 4665 Lampson Avenue, Los Alamitos, California 90720. The work upon which this document is based was performed pursuant to Contract NE-C-00-3-0064 with the National Institute of Education. SWRL reports do not necessarily reflect the opinions or policies of the sponsors of SWRL R&D.

# A LABORATORY FACILITY DEDICATED TO EDUCATIONAL R&D Volume I

Edited by William H. Hein, Jr.

SWRL EDUCATIONAL RESEARCH AND DEVELOPMENT
4665 Lampson Avenue, Los Alamitos, California 90720

# PREFACE

The documentation of large-scale development endeavors in education is a phenomenon with which the educational R&D community has had modest experience, since there has been little large-scale development to document. SWRL documentation experience confirms the applicability of Derek Price's conclusion regarding the literature of research and the literature of development.

> A scholarly publication is not a piece of information but an expression of the state of a scholar or a group of scholars of a particular time. We do not, contrary to superstition, publish a fact, a theory, or a finding, but some complex of these . . . . If the paper is an expression of a person or several persons working at the research front, we can tell something about the relations among the people from the papers themselves . . . . It seems that technologists differ markedly from both scientific and nonscientific scholars. They have a quite different scheme of social relationships, are differently motivated, and display different personality traits [Price, 1970, pp. 7-9].
>
> Clearly, the published paper is not, in general, the end product of a worker in a technological subject; he appears to be instead concerned chiefly with the production of an artifact or process. What then is the role of literature in technology? I suggest that for the most part it is produced as an epiphenomenon. It comes about because many technologists have had scientific training and know full well the code of behavior of the scientist in which publication is not merely right and proper, but a high duty and a behavior expected by peers and employers . . . . In general new technology will flow from old technology rather than from any interaction there might be between the analogous but separate structures of science and technology [Price, 1965, pp. 560-561].

SWRL experience has been that the course of a well-managed development effort produces considerable documentation but that a good deal of the substance of the information exceeds structures and strictures of journal publication. The journal article constitutes an available medium, but the laundering of the information required to use the medium often washes out the message.

SWRL has found it unproductive to treat information and documentation in the abstract as a "communication problem." A more useful approach is to consider operational means of making information pertinent to large-scale development in education conveniently available to interested audiences. This perspective directs attention to specifying interested audiences and devising communication compatible with their need-to-know characteristics. SWRL information architecture recognizes several audiences.

Staff involved in the development per se and the contract sponsor are two of the most immediate audiences addressed by SWRL documentation. Communication relevant to these audiences is handled by SWRL Technical Notes and Technical Memoranda that chronicle the course of SWRL R&D. These documents range in length from a few to a few hundred pages depending upon their nature. Some 200 of these Technical Notes and Technical Memoranda are issued during the course of a year--a stack several feet tall.

A third audience is the invisible colleges in which SWRL staff actively participate. Collegial exchange of selected Technical Notes and Technical Memoranda serve this audience adequately.

Another audience is product users. A volume of product working papers that brings together the documents associated with the development of each product is issued at the time the product is made available for general use and provides relevant information for this audience.

This leaves the general audience of students, scholars, and other members of the R&D community in education. SWRL Technical Reports and Professional Papers, largely accessed via the ERIC system, are directed to this broad audience. Journals, professional meetings, and other classical scientific and technical information exchange mechanisms are also used.

But each of these mechanisms involves a packing and rationalizing of information into independent pieces that inherently involves time delays and loses some of the original flavor of the work in the process. To reduce the time interval and retain the freshness of the work, a Working Papers series was initiated in 1972.

Some Working Paper volumes are annualized. That is, the thematic topics that provide convenience categories for representing inquiry completed during a year that are of timely interest to a sector of the educational R&D community are identified. The relevant documents are then organized into volumes constituting a set of Working Papers. Other volumes may be organized on the basis of documented progress status across time. Such is the case of the present Working Papers: A Laboratory Facility Dedicated to Educational R&D. Activity initiated in 1969 is chronicled through facility planning, construction, equipping, and three years of operation--a six-year time period.

Three companion volumes constitute the full set of Working Papers:

Volume I (Here included) contains the technical substance of activity, Papers 1-12.

Volume II, Exhibits 1-35, contains the technical attachments for Papers 1-5.

Volume III, Exhibits 36-73, contains the technical attachments for Papers 6-12.

# CONTENTS

| Working Paper | | Page |
|---|---|---|
| | A LABORATORY FACILITY DEDICATED TO EDUCATIONAL R&D<br>William H. Hein, Jr. | 1 |
| 1 | PLANNING FOR CONSTRUCTION AND EQUIPPING OF AN EDUCATIONAL RESEARCH AND DEVELOPMENT LABORATORY (TM 1-71-03)<br>William H. Hein, Jr. and Richard E. Schutz | 5 |
| 2 | PREPARATION AND REVIEW OF APPLICATION FOR CONSTRUCTION OF AN EDUCATIONAL RESEARCH AND DEVELOPMENT LABORATORY (TN 1-75-03)<br>William H. Hein, Jr. | 19 |
| 3 | CONTRACTING IN FEDERALLY-SUPPORTED R&D CONSTRUCTION PROJECTS (TN 1-75-02)<br>Robert L. Christensen and William H. Hein, Jr. | 31 |
| 4 | FAST-TRACKING FEDERALLY-SUPPORTED CONSTRUCTION OF EDUCATIONAL RESEARCH AND DEVELOPMENT FACILITIES (TN 1-72-04)<br>William H. Hein, Jr. | 45 |
| 5 | BUDGETING IN FEDERALLY-SUPPORTED CONSTRUCTION MANAGEMENT PROJECTS (TN 1-72-06)<br>William H. Hein, Jr. | 53 |
| 6 | COMPLIANCE AUDIT OF FEDERALLY-SUPPORTED EDUCATIONAL R&D CONSTRUCTION PROJECTS (TN 1-73-02)<br>William H. Hein, Jr. | 59 |
| 7 | REVIEW OF FINAL REPORTS OF COMPLIANCE AUDITS OF FEDERALLY-SUPPORTED EDUCATIONAL R&D CONSTRUCTION PROJECTS (TN 1-74-03)<br>William H. Hein, Jr. | 71 |
| 8 | RELOCATING TO A NEW EDUCATIONAL R&D FACILITY (TN 1-75-04)<br>Robert L. Christensen | 83 |

Working Paper — Page

9 SUMMARY OF PLANNING AND ACTIVITIES FOR BUILDING DEDICATION CEREMONIES, June 2, 1972 (TN 4-72-08) 95

William F. Coulton

10 OPERATIONS STUDIES - CUSTODIAL AND GROUNDS MAINTENANCE SERVICES FOR AN EDUCATIONAL R&D FACILITY (TN 1-75-02) 125

Robert L. Christensen and William H. Hein, Jr.

11 OPERATING A FACILITY DEDICATED EXCLUSIVELY TO EDUCATIONAL RESEARCH AND DEVELOPMENT (TN 1-74-01) 143

Robert L. Christensen

12 PLANNING, PROCUREMENT, INSTALLATION, AND MAINTENANCE OF EDUCATIONAL R&D EQUIPMENT SYSTEMS IN A NEW FACILITY (TN 1-75-05) 165

William H. Hein, Jr.

# A LABORATORY FACILITY DEDICATED TO EDUCATIONAL R&D

William H. Hein, Jr.

SWRL Educational Research and Development received a grant, dated June 30, 1970 in the amount of $4,286,000 to plan, construct and equip the first facility constructed exclusively for educational research and development on a non-campus site. Shortly after grant award, USOE, HEW-FECA (Facilities Engineering and Construction Agency) and SWRL agreed to test new construction techniques, known as construction management and fast-tracking, on the project. The success of the experiment is well demonstrated by the fact that design and construction were completed in less time than the six other R&D institutions that received construction grants. In addition, the Office of Management and Budget confirmed FECA's estimates of savings of public funds of $15,041,000 resulting from use of the new techniques as well as federally-owned land in the project.

All three parties realized that the grant had been written under the presumption of general contract for construction as contracted with construction management. If they had then taken time to rewrite the grant, many of the potential savings would have been eliminated before the project started. Therefore, they undertook an endeavor that is unique in Federally-supported construction, namely to comply with a grant written for a general contract and at the same time give the new techniques a fair test.

Working Paper 1 describes the process followed by SWRL in planning the new facility, and the planning principles that were developed and followed during this process. The results of the planning are set forth in the form of descriptions of the special purpose, staff office, secretarial and working spaces that were included within the plans for the facility as well as their relationships to each other. The process followed in obtaining approval of the grant application is discussed in Working Paper 2. Included are the means utilized in complying with the authorizing legislation, regulations and agency guidelines. The materials utilized in both the program review and the technical review of the application resulting in the award of the grant are described.

Working Paper 3 sets forth the procedures followed in selecting the contractors and establishing their fees; the forms of contracts utilized; and the reporting relationships observed by SWRL, Government representatives and the contractors. Working Paper 4 reports SWRL's experience in applying the principles of construction management and fast-tracking. Also included are benefits resulting from the use of these techniques as well as suggested changes in the flow of decisions that should be incorporated into future projects of a similar nature. Working Paper 5 treats the process used by the construction manager in estimating costs, their verification by SWRL and the methods by which they can be used in establishing a construction budget.

Working Papers 6 and 7 indicate the nature of documentation that should be prepared by the grantee of an experimental construction project in order to insure a fair and accurate compliance Federal audit and procedures to be followed in obtaining reviews of final reports of compliance audits. SWRL's documented experience in consolidating and moving its operations to the new facility is contained in Working Paper 8. The planning and activities for the building dedication ceremonies is described in Working Paper 9.

Working Paper 10 describes the operations studies in the area of custodial and grounds maintenance services. The results of operations studies conducted in order to refine the procedures associated with installing programmatic research and development activity in a new facility are reported in Working Paper 11. Working Paper 12 sets forth the procedure followed in the planning, procurement, installation and maintenance of the R&D equipment and equipment systems acquired under the construction grant.

The working papers are in three volumes. The first sets forth the technical substance of the working papers, while the remaining two contain the attachments to which reference is made throughout Volume 1. This permits the reader to utilize the volumes in a "side-by-side" manner, making convenient reference to the pertinent attachments to which citations are made.

## Working Paper 1

## PLANNING FOR CONSTRUCTION AND EQUIPPING OF AN EDUCATIONAL RESEARCH AND DEVELOPMENT LABORATORY (TM 1-71-03)

William H. Hein, Jr. and Richard E. Schutz

### Introduction

In this paper we will: (1) describe the site location criteria; (2) identify the principles followed in planning for the facility and equipment; (3) discuss the roles of the specialist groups in the planning process; (4) set forth the program requirements in terms of the general types of space required; (5) specify the program interrelationships of the various spaces and the resulting locations thereof; and (6) describe the special architectural and engineering criteria and the square footage allocations for the various spaces.

### Site Location

The following criteria were established by the Laboratory Board of Directors in 1966. Each criterion is followed by a description of those features of the Los Alamitos site that satisfy that criterion.

| CRITERION | SITE FEATURES |
|---|---|
| 1. Presence of institutions conducting educational research. | University of California and California State College Campuses can easily be reached. |
| 2. Available transportation to concentrations of subpopulations in the Laboratory's region. | San Diego, 605 and Garden Grove Freeways are immediately adjacent to site; Harbor, Santa Ana and Long Beach Freeways are very close. |
| 3. Supporting industries. | Nearby hotel and restaurant facilities for visitors and school personnel being trained. |
| 4. Nearby libraries containing sources of educational research. | University of California and California State College Campuses. |
| 5. Sources for permanent, part-time, and temporary Laboratory staff members. | Urban area with large concentrations of housing tracts and apartment areas for all income groups. |

| | | |
|---|---|---|
| 6. | Climate and access to cultural and recreational facilities. | Site is centrally located in large urban area with a semi-tropical climate; beach is very close. |
| 7. | Nearby housing for staff members and their families at a reasonable cost. | Same as 5. |
| 8. | Nearby student populations representing various socio-economic and ethnic groups. | Same as 5. |
| 9. | Suitable building site available at a cost acceptable to federal officials. | Free long term use of level 12 acre site granted to Laboratory by OE. |
| 10. | Near an airport. | Long Beach, Santa Ana and Los Angeles Airports reasonably close. |

## Planning Principles

The Laboratory facility will be the first federally financed building constructed exclusively for educational research and development on a non-campus site. Since there were no direct precedents to guide the planning, successful techniques utilized in other types of construction had to be adapted for Laboratory use. Consequently eight principles were developed early in the planning stage to provide guidance for the planning team in the performance of their various functions:

1. The planning is to be conducted on an "inside-out" basis. In other words, the facility is to be an enclosure around the spaces identified as necessary to conduct the Laboratory program as contrasted with the fitting of Laboratory functions into an already-designed building.

2. An experienced team from several specialities will work with the staff in the planning.

3. The planning process will proceed on parallel paths as opposed to a single linear path.

4. The move-in date must be as early as possible since the Laboratory is suffering direct and indirect costs each month that it remains in leased quarters in four widely-scattered locations.

5. Office partitions must be movable to allow reconfiguration for any future reorganizations or management requirements.

6. Special purpose space allocations will remain constant for the forseeable future, and any future expansion will be in office space.

7. Production space will be devoted to prototype production, and large volume production will be contracted out.

8. The Laboratory facility will be utilized solely for the Laboratory's educational research and development program. Thus there will be no use of the facility and equipment by outside agencies.

## Planning Participants

The planning team included six specialist groups. The first was the Laboratory staff whose role was to describe the program requirements to be reflected in the facility and equipment.

The second member was the Center for Environmental Structure of Berkeley, California. This firm acted as a design consultant and utilized formalized analytic techniques termed environmental pattern language to convert the Laboratory's program requirements to a form amenable to design solutions. Each pattern is an if-then statement with an accompanying discussion. The "if" is expressed in program terms; the "then" expresses a solution in design terms. A discussion follows which sets forth the program-design rationale together with reference to any pertinent research that supports the design solution. An example is

IF: there is a studio and control room in which TV and/or film prototypes are produced,

THEN:
1. Walls surrounding the studio and control room are opaque, admitting no natural light.
2. Construction of these walls are designed to admit no more than 5 decibels into the area from outside areas.

3, 4, etc.

PROBLEM: Discussion of the rationale and supporting research supporting the THEN solution statements.

The design consultant prepared a complete set of pattern statements for the special requirements of the Laboratory after conferences with various Laboratory staff members and review with the Laboratory management.

The third team member was Alta California Systems, Inc. of Stanford, California. Alta prepared a set of facility specifications setting forth specialized architectural and engineering criteria based on the media and other program requirements of the Laboratory after consultations with the Laboratory staff and the architects. Alta also assisted in the equipment planning as discussed below.

The fourth member is an internationally-known firm of architects, Skidmore, Owings and Merrill of San Francisco, California. The Architects will prepare the drawings and specifications and will provide general supervision of the project to insure compliance with the construction documents and applicable laws and regulations.

The fifth team member is the construction manager, Turner Construction Company. This company handles over 500 million dollars of construction projects a year, 60% of which are as a construction manager. Under construction management, Turner is retained as as agent or consultant of the Laboratory to provide construction expertise for the architects while the drawings and specifications are being prepared. Such services will include investigations and consultation with the architect regarding the availability, suitability and cost of materials and equipment. They also will include the preparation of estimates of the cost of alternate designs for the various elements of the project, as requested by the architect or Laboratory, and the continuing review of drawings and specifications from the standpoint of economy in construction. Upon completion of the design, the construction manager will prepare an estimate of the cost of the project together with a detailed schedule for construction. It will then solicit and receive competitive bids from contractors and material vendors for the various portions of the work and make recommendations for award of contracts by the Laboratory. Thus there will be several general contracts between the Laboratory and contractors who would otherwise be subcontractors to a general contractor. For an additional fee, the construction manager could enter into all subcontracts and assume total responsibility for the project under a single contract negotiated with the Laboratory. During construction, Turner will perform many of the services provided by a general contractor; however it will not perform any construction work on the project. If review by State agencies in California of the plans and specifications had not been required, it would have been possible to construct the facility in phases, and actual work could have begun before the plans and specifications had been completed, resulting in an earlier move-in date.

The sixth member is the Federal Government, the funding agency. As such it is concerned with monitoring and advisory functions to insure compliance with the terms of the grant.

All team members are experts in their areas of specialization. They will all interact with each other at all stages of the planning and construction as the need for their specialized skills arises. This team approach and the construction management process have many advantages over a linear planning and construction process followed by many public agencies.

## General Allocation of Spaces Between Floors

The facility will have two stories with a gross area of 44,400 square feet each. A 4,500 square foot landscaped court will be located in the interior of the building. The first floor will contain all of the specialized purpose spaces with the exception of the Library. It will also house those staff members of the Division of Resource Service and Business Services who will be receiving many callers. In addition, the computer support staff will be housed on the first floor immediately adjacent to the Data Processing Area. Thus most visitors will be able to conduct their business on the first floor, and the second will be devoted exclusively to office, working and secretarial spaces along with the Library.

Of the gross total of 88,800 square feet in the facility, 65,000 will be assignable resulting in a building efficiency of 74.2%.

## First Floor

The first floor has seven special purpose areas totaling approximately 26,000 square feet and 8,600 square feet of office, secretarial and working spaces. All Division of Resource Service personnel will be housed on the first floor in order to be near the Reception, Production areas and Conference Areas. Personnel, Accounting, Purchasing and Building Management staff members will also occupy first floor offices to be accessible to applicants for positions and to vendors and the Receiving Area.

## Research/Simulation Area

The first of the seven special purpose areas on the first floor will be the Research/Simulation Area (Diagram 1). A total of 6,660 square feet will be subdivided into a Student Reception Area of 1,020 square feet, Simulation Laboratory of 3,620 square feet and seven Learning Labs and a Control Center totaling 2,020 square feet. This entire area will support research related to individual, small group, and large group instruction. Instructional and training activities, as well as prototype and component validation, will be conducted in these spaces. Research participants will be brought to the Laboratory by vehicle and will enter and depart by way of the Student Reception Area. At no time will they enter any Laboratory area other than the Research/Simulation spaces.

The Learning Labs will be utilized for individuals and small groups of children. Access to the Control Core and the Student Reception Areas will be provided. One to three subjects will be able to work in each cubicle. Within each cubicle, aural and visual stimuli will be available, controlled by the subject and/or the researcher. The stimuli may be in any standard audio-visual format or it may be live or recorded television. Teletype terminals will also be utilized so that subjects can interact with a computer located inside or outside the facility.

A Control Center will be the core of the individual Learning Lab cubicles. Apparatus for the display of aural and visual stimuli will be housed in this area. Also it will be possible to have display devices in this control area producing actual displays in the cubicles. Observation of activities in the cubicles will be possible through use of television monitors, and cameras will be controlled from the core area. This will enable staff members to manipulate and monitor the environment in several cubicles at the same time. It will also allow coordination of simultaneous activities resulting in more efficient utilization of personnel and equipment. The Control Center will be tied to the A-V Control and Data Processing areas by conduit.

The Simulation Laboratory Area will be an open space for configuration as program requirements dictate. To insure maximum flexibility, no fixed equipment or furnishings will be placed in this Area. Access will be provided to the Student Reception Area. Also students and staff members in this space will have access to media transmission from the A-V Control Area and data signals from the Computer Area. Provision will be made for the use of standard audio-visual equipment, and classroom equipment will be available. Underfloor duct networks for power and media signals will also be provided.

## Data Processing Area

The second of the seven special purpose areas on the first floor will be the Data Processing Area (Diagram 2). A total of 2,800 square feet will contain spaces for a Central Processor Facility, Teletype and CRT Terminals, Storage Area, and Work Area. The data concentrator in the Central Processor Facility will be tied, by telephone lines, to larger computer centers outside the Laboratory building. The terminals in the Teletype and CRT Terminal Areas will be tied by cable to the central processor. Microfiche and audio information will be directed to the Learning Labs and Simulation Laboratory by the central processor. The Central Processor Facility will have raised flooring.

The Terminal Areas will provide facilities for interaction with the data concentrator. Programmers will work independently or in groups of up to three persons with the teletype and CRT terminals. Keypunching, sorting, batching and other preparatory operations will be conducted in the Storage and Work Area. Also data in card, tape and disc form will be stored in this space. The area will have raised flooring in order to provide for possible increase of central processor equipment.

## Audio-Visual Production Area

The third specialized area on the first floor will be the Audio-Visual Production Area of 2,670 square feet (Diagram 3). This will include an A-V Studio of 1,230 square feet, Audio Production Studio of 395 square feet, A-V Control Room of 410 square feet and A-V Storage of 235 square feet. These facilities will support the Laboratory program primarily through the in-house development of prototypical software and preparation of materials for the public information efforts.

The A-V Production Studio will be used for television production (video tapes), motion picture production and still photography. Attention will be given to accoustical features and location away from vibration and noise producing areas such as mechanical rooms and print shop. It will also have a raised ceiling.

The Audio Production Studio will serve as a recording area for audio programming supporting the development of instructional and training systems and audio instruction programs. It will be located near the A-V Production Studio so that it can also serve as an announce booth for film and television production.

The A-V Control Room will serve the electronic control requirements of both the A-V Production Studio and the Audio Production Studio. This control facility will also receive, process and distribute audio and visual signals throughout the Laboratory where remote capabilities are necessary. In addition, to provide for higher utilization of equipment and space, the technical audio operations of duplicating, mixing and editing will be conducted in this area. This will permit technical personnel to schedule and carry out all technical audio activities in a central location.

## Film Production Area

The fourth specialized area on the first floor will be the Film Production Area (Diagram 4). 717 square feet will be devoted to a Film Editing Office, Film Storage and Film Preview Room. These facilities will support the production efforts in the area of motion picture production.

The Film Editing Area will provide space for planning and scripting productions as well as highly technical editing operations. The Film Storage area will contain all equipment, supplies, and film required for motion picture production activities.

The Film Preview Room will be used primarily for conferences regarding materials in the editing stages. A back-up function may be served by this room for the viewing of prototype projected materials for small groups (up to 19 people). Optical projection will be provided from the Projection Control Area associated with the Conference Room and discussed below.

## Production Support Area

The fifth specialized area will be the Production Support Area (Diagram 5). A total of 5,500 square feet will contain a Design Studio, Production Planning Office, Photo Lab, Print Shop, and Shipping and Receiving space. These areas will provide production support to all programs of the Laboratory.

Illustration, copy-photography, drafting, and layout for all hard-copy information generated in the Laboratory will be produced in the Design Studio of 1,260 square feet. In addition, graphics required for production of audio-visual sequences will be prepared here. The Studio will be located reasonably close to the Print Shop since most of the materials produced will be processed in the latter location.

A Photo Lab of 400 square feet will handle the processing of black and white film to meet prototype requirements. Larger jobs will be processed outside the Laboratory by private vendors.

A Print Shop of 1,940 square feet will be utilized principally for the reproduction of prototypical copy. Established programs will be printed by the Government Printing Office or its local vendors. Activities to be conducted in this area will include plate making, binding, collating, reproduction, bulk paper-cutting, and xeroxing. The entire space will be treated for sound transmission control and sound absorption. Since the Print Shop will receive materials from the Design Studio and will transfer materials to the Shipping and Receiving Area, the location of these three areas will be as close as possible.

A Shipping and Receiving facility of 1,640 square feet will accomodate all materials produced in-house and that portion of materials produced outside the Laboratory which are returned for repackaging and reshipping. Materials in process and bulk stock will be stored here, and the mailroom function will be housed in this area. There will be a covered ramp at the exterior entry which will serve as a loading dock for mobile vans and trailers used for testing and mobile A-V production.

## Shop Area

The sixth specialized area on the first floor will be a Shop Area of 2,554 square feet (Diagram 6). It will contain an Electronic Laboratory of 270 square feet, a Machine/Wood Shop with storage of 820 square feet, and a Materials Assembly and Electronic Test Area of 1,464 square feet. Personnel assigned to these facilities will support the Laboratory program through the production of experimental apparatus for use in instructional and other systems. Maintenance support of A-V equipment for the entire Laboratory will also be conducted in this space.

## Conference Facility

The seventh specialized area on the first floor will be the Conference Area totaling 2,800 square feet (Diagram 7). It will contain three divisible conference areas and an additional 225 square feet for projection and storage. It will be used for meetings of the Board of Directors, Advisory Council, and large groups of school personnel attending briefing sessions and training in the use of Laboratory products. Other uses will be staff meetings, division level meetings, rehearsal for video and audio productions and vendor product demonstrations.

The use of sound-attenuating partitions will permit simultaneous use of a number of different space sizes namely one group of 150 persons; two groups of 75 persons; or one group of 75 persons, and two groups of 35 each. All furnishings will be moveable, and moveable partitions will permit immediate reconfiguration.

The Projection Control Area will be contiguous to the Conference Room, and will provide projection to either of two group sizes according to partition arrangement. Projection may also be directed to the Film Preview Room discussed above. All controls available in the Conference Room and Film Preview Area will be duplicated in the Projection Control Area. This will provide capacity for total presentation from the Projection Control Area to the Conference and Film Preview Areas.

## Reception and Display; Food Service

A Reception and Display Area of 3,280 square feet will be located at the front entrance on the first floor viewing the court yard. Displays of Laboratory products will be in this area as well as the receptionist and switchboard operators.

A Food Service Facility of 315 square feet will be equipped and staffed by a State Agency providing employment for the blind. Walk-through service of sandwiches, canned foods, cold drinks, etc., will be provided.

## Second Floor

The second floor will contain the eighth special purpose space, a Library of 3,200 square feet (Diagram 8). This floor will also have 28,140 square feet of office, working and secretarial space. As stated above, most visitors will be accomodated on the first floor leaving the second floor relatively free of traffic of persons not on the staff.

## Library

The Library will be used for staff reference purposes. It will provide accessibility to current professional literature, research data, and resource files. It will contain space for a Main Library, Library Processing, Microform, Product Reference and 3 Reading Rooms.

The Main Library will contain current periodicals in addition to hard cover materials. There will be a charge desk and catalog system. The Library Processing Area will provide space for ordering, receiving, cataloging, book repair, and supervision of the library complex.

The Michroform Area will house the ERIC michrofiche collection plus microfilmed data. Two reader/printer work stations will be provided with direct access to microfilm storage files and supplies. Likewise five reader work stations will be provided with access to microfiche storage files.

The Product Reference Area is planned for storage of current products of the Laboratory and other relevant research groups, and standardized test resource files. Also the Reading Rooms will serve a dual role as back-up facilities for general Laboratory conference requirements.

## Office, Working and Secretarial Spaces

The staff offices will be configured into 1, 2, 3 and 4 man offices. Secretaries will be in open bays adjoining the staff members to whom they are assigned. Open or working space is provided for each set of offices within which staff members can conduct noise-producing operations that would disturb their office-mates such as short conferences of a small group nature. In addition, work that is too voluminous for an office can be conducted in these areas.

## General Criteria for Office Assignments, Parking

One-man offices will be occupied principally by Management and MPS staff. When desired, there personnel will have their telephone answered by a secretary via a call director. All secretaries will be in open bays. Junior professional staff will share offices with other junior professional staff members. Graduate Associates and interns will be assigned desks in open work areas.

Approximately 400 parking spaces will be provided on an adjoining 4-acre, one-level parking lot. No attempt will be made to assign spaces to individuals. Future expansion can be accomodated by building a parking structure if necessary.

## Allocation of Office Space Among Divisions

The allocation of offices among Divisions will be made on the basis of a five-year projected personnel distribution (See Table 1). The location within the building of each Division is based on the need to be accessible to special purpose space or the personnel of another Division (Diagrams 9 and 10). It is planned to assign Management Support the following spaces on the second floor.

1 - 200 square foot office (Laboratory Director)

1 - 150 square foot conference room (Laboratory Director)

5 - 150 square foot offices

2 - additional offices (200 square feet and 150 square feet for expansion)

1 - work space (250 - 300 square feet)

2 - secretarial spaces (350 - 700 square feet)

Those persons responsible for Building Management, Purchasing, Personnel, and Accounting will be near each other on the first floor in the following spaces.

1 - 150 square foot offices

2 - 120 square foot offices

4 - 100 square foot offices

1 - work space (250 - 300 square feet)

2 - secretarial work spaces (350 and 700 square feet)

Product Design will be located on the second floor between Management Support and Product Development and near the Library. The Division Head will be centrally located within the Division's space in an office of 150 square feet. 12 MPS will occupy individual one-man offices of 120-150 square feet each. 36 junior professional staff will occupy 13 2-3 man offices of 110-150 square feet each. Although junior professional staff are assigned to an MPS in charge of an activity at an approximate ratio of 3 to 1, grouping in offices need not be by activity. 11 secretaries will occupy 3 secretarial spaces of 500-600 square feet each. 2 technicians and 7 interns or graduate associates will have desks in 3 open work space areas of 400-450 square feet each.

Product Development will occupy the space between Product Design and Product Integration on the second floor. The Division Head will be assigned an office of 150 square feet centrally located within the Division's space. 20 MPS will be assigned to scattered individual one-man offices of 120-150 square feet, and 65 junior professional staff to 20 2-3-4 man offices of 110-180 square feet each. 22 secretaries will occupy 4 open space areas of 450-700 square feet in groups of 5-6 scattered throughout the Development assigned area. Two technicians and seven interns and graduate associates will work in 3 open work space areas of 450-600 square feet each.

Product Integration will be assigned the space between Product Development and Management Support on the second floor (32 offices) and adjacent to the Data Processing Area on the first floor (11 offices). The Division Head will have an office of 150 square feet centrally located within the Division's space on the second floor. 16 MPS will occupy scattered one-man offices within the assigned space on the second floor and 2 on the first floor of 110-120 square feet each. 62 junior professional staff will be in 24 scattered 2-3-4 man offices of 100-180 square feet each. 23 secretaries, 10 technicians and 7 interns and graduate associates will work in 11 open space areas scattered throughout areas on both floors.

Resource Service will occupy a total of 26 office spaces, 3 work areas and 3 secretarial spaces. The Division Head will have an office of 180 square feet with direct access to the Conference Area and liaison staff members. His office and those of Liaison Services will be designed with particular esthetic appeal in that these areas often provide the only SWRL contact for outside visitors. The MPS responsibile for liaison activities will have a 150 square foot office with access to the Division Head's office. All Resource Service personnel will be housed in 19 offices on the first floor and in 6 on the second floor near the Library.

## Equipment

Alta California Systems Inc. acted as consultant in preparing an acquisition and implementation schedule for all equipment items and systems after analyzing the Laboratory's program requirements and facility. A carefully sequenced schedule will be utilized and will include the requirements for technical personnel and a schedule for their utilization. This schedule will include timing requirements for training or recruitment of these personnel.

## Summary

In brief, the new Laboratory facility will reflect the Laboratory's program requirements. The equipment will be compatible with the facility, and the facility will contain the necessary architectural and engineering characteristics to accomodate the staff and equipment. This planning accomplishment has involved the synchronous efforts of the specialist groups.

## Working Paper 2

## PREPARATION AND REVIEW OF APPLICATION FOR CONSTRUCTION OF AN EDUCATIONAL RESEARCH AND DEVELOPMENT LABORATORY (TN 1-75-03)

William H. Hein, Jr.

### Authorizing Legislation; USOE Guidelines

The Educational Research Facilities program was a construction program authorized under the Cooperative Research Act of 1954 (P.L.83-531), as amended by Title IV of the Elementary and Secondary Education Act of 1965 (P.L.89-10). The Act vested in the U. S. Commissioner of Education the authority to make grants to a university, college, or appropriate public or nonprofit private agency whenever he found that the purpose of the Act could best be achieved through the construction of a facility for research and that such facility would be of particular value to the Nation or region as a national or regional resource for research or related purposes. The Act also provided that such assistance could be provided to a combination of educational institutions such as SWRL.

The USOE issued guidelines, dated November 1967, entitled *Guidelines and Applications Procedures for the Educational Research Facilities Program*. Under Section II of these Guidelines, the construction funds were to be utilized primarily to house those programmatic research and related activities financed by the Office of Education. Section III provided that the Office of Education would issue invitations to submit applications for construction grants only to qualified Regional Educational Laboratories and Universities with Research and Development Centers. In order to be qualified, the institution's program must have been reviewed by the USOE staff and a panel of external consultants and a recommendation made that an invitation be issued.

Under the Guidelines, the programmatic research and related activities financed by the Office of Education were termed "invited program(s)." Educational research and related activities, other than the invited program(s) to be housed in the facility, were termed "additional program(s)." "Other programs" were those programs to be housed partly or wholly in the total facility but were not involved primarily or solely in educational research. Construction costs were to be prorated in the application among "invited," "additional," and "other" programs according to the percentage of assignable area in the total facility each was to utilize. The space for the invited program(s) for a Regional Educational Laboratory could be funded for 100 percent of the cost.

Where it was desirable for a Laboratory or Center to be housed in a facility which contributed to the support of other research and development activities in education, facilities for such "additional program(s)" could be funded on a matching basis in a manner negotiated between the Office of Education and the institution. No portion of the facility costs assignable to "other program(s)" could be funded by the construction funds. Since the SWRL program was totally dedicated to educational R&D funded by the Office of Education, its grant application provided only for construction of space for an "invited program."

## Program Review

The USOE Guidelines provided that the Office of Education would issue an invitation to apply for construction funds to an organization only after a thorough program review designed to ascertain that it met the following general conditions.

1. The program of the applicant related clearly to and served a major national or regional educational research need, and

2. The program of activities effectively contributed to the solution of educational problems and showed promise of continuing to contribute to the solution of such problems over an extended period of time.

More particularly, an invitation to submit an application was to be extended only after the past and projected program of the prospective applicant had been thoroughly reviewed with respect to such factors as:

1. mission, focus, and objectives of the program;
2. quality and balance of program activities;
3. long-range as well as short-range plans;
4. program management and development policies and procedures;
5. organizational or governmental structure; and
6. personnel.

By the time that the program review of SWRL was conducted, more specific criteria had been prepared by the USOE staff and Advisory Council (Attachment 1).

The Guidelines further provided that following a favorable recommendation by the program review team, an invitation to apply for construction funds would be issued upon a finding, by USOE and its advisory bodies, that a facility would:

1. contribute positively to the purposes, stability, and visibility of the activity;

2. provide specialized and adaptable space for research activities which would otherwise be difficult or impossible for the prospective applicant to acquire through other channels; and

3. actively promote the interdisciplinary and interdepartmental support of the programmatic effort.

Following authorization to submit an application for a construction grant under the above Guidelines, by the SWRL Board of Directors (Attachment 2), a prospectus was prepared for the program review (Attachment 3). A team of USOE staff and consultants then made a site visit to the SWRL program. Their unanimous recommendation was that SWRL be granted a five year contract and extended an invitation to submit an application for a construction grant (Attachment 4).

## Grant Application

### Criteria for Evaluation

The criteria utilized in evaluating applications for construction grants were found in several places. As stated above, section 4(b) of the Cooperative Research Act empowered the Commissioner of Education to make a grant for construction upon a finding that the purposes of the Act could best be achieved through the construction of a facility for research, and that such facility would be of particular value to the Nation or a region thereof as a national or regional resource for research or related purposes.

Section 151.7 of the Regulations provided that in addition to whatever other criteria might be specified with regard to a particular program or project, all applications would be evaluated on the basis of the following criteria:

A. the soundness of program or project plan;

B. the likelihood of securing productive results;

C. the adequacy of resources to conduct the proposed program or project; and

D. the relationship of the proposed program or project to other similar programs or projects already completed or in progress.

Section VII-A of USOE's Guidelines contained a set of broadly-stated criteria which could be used, at the discretion of the U. S. Office of Education panel, to develop more specific and somewhat more technical criteria. Applications were to be evaluated on the basis of the degree to which the proposed facility:

1. contributed positively to the purposes, stability, and visibility of the activity;
2. provided specialized and adaptable space which would otherwise have been difficult or impossible for the applicant to acquire through other channels;
3. reflected current and projected program activities of the applicant;
4. promoted the interdisciplinary and interdepartmental support of educational research and development; and
5. met the specialized requirements of the individual program including providing the necessary support activities, i.e., computer back-up, clerical and research assistant personnel, etc.

The criteria that were utilized by the USOE team that evaluated the SWRL application were in the form of the following questions.

1. Are the programs and activities proposed to be housed in the facility consistent with earlier presentations and projections, reasonable in terms of updated staffing and budget projections, and adequately described for purposes of assessing space and equipment requirements?

2. Are the program and activity specifications for both space and equipment clear, consistent, meaningful and reasonable?

3. Are special environmental requirements adequately identified and meaningfully related to specified program needs? Are unusual requirements so identified and justified?

4. Does the proposed location of the facility promote the convergence of interdisciplinary or interorganizational support of the programmatic efforts?

5. Have considerations of economy been adequately incorporated into the total facility project? Are cost estimates reasonable? Please note:

   - design efficiency
   - type of construction
   - cost per square foot

### Requirements of USOE Guidelines for Contents

The USOE Guidelines contained requirements as to the contents of the grant application. It was mandatory that the application set forth the total cost, gross area, estimated cost per square foot of gross area, square footage of assignable space, amount of grant request, and amount of local participation. In addition, information as to the program to be housed, estimated costs and proposed sources of funds was to be provided. Further information that was to be furnished included five-year projections of budget and personnel requirements, documentation of the relationship of program needs and space requirements, equipment to be housed, schematic design, simple specifications, construction budget and estimated construction schedule.

The schematic design was to include a plot plan and preliminary sketches. The plot plan or site plan was to show the location and perimeter of the proposed site and indicate specifically the limits of the site improvement work. It was to show topography, buildings, location of utility services lines, access roads and parking areas.

The preliminary sketches were to consist of plans and elevation views of the building. Floor plans were to be drawn roughly to scale and show the layout, labeled or coded to indicate the category of room or space. The simple specifications were to indicate proposed types and quality of building materials.

These preliminary sketches and simple specifications were required for tentative approval of the application. Before final approval would be given, the grant applicant was to submit preliminary drawings of the proposed facility. These drawings were to present the same information as required for the preliminary sketches but were to be drawn "precisely to scale." Detailed outline specifications were also to be submitted indicating "the exact type, brand and quality of construction materials." The USOE Office of Construction Service was to then conduct a review to determine whether the proposed facility met "the demanding requirement of being structurally and architecturally sound, aesthetically pleasing, and yet, not extravagant in design or use of materials." Upon completion of this review, final decision on the application was to be made.

## Contents of SWRL Application

The SWRL laboratory was to be the first facility totally dedicated to educational research and development in the Nation to be constructed on a non-campus site. Therefore, before submission of the application, USOE program and operations staff members and SWRL staff met with USOE construction officials and agreed on a format for the application that met the requirements above of law, regulations and guidelines; was within SWRL's capability to prepare with the financial resources it had available; and provided sufficient data to permit a reasonable and responsible review by Federal program and construction officials and their consultants. The Federal representatives emphasized that the contents of the application would have to satisfy the requirements of four distinct "audiences." These parties were the Bureau of the Budget (costs and efficiency ratio); USOE program staff (relationship of spaces to approved program); HEW construction officials (technical construction features); and the SWRL architect (functional specifications that were to be met in the design of building). The participants at this meeting were able to reach sufficient agreement to specify the table of contents to be used in the SWRL application (Attachment 5).

The most informative feature of the SWRL application was a summary of all identifiable spaces in the proposed facility (Attachment 6) together with references to the "patterns" (functional specifications) discussed below and space requirement forms that affected such spaces (see examples in Attachment 7). The size of each space and the number of employees to be housed therein were specified. The space requirement forms set forth the acoustical, audio visual, communication, built-in furniture, equipment, electrical, heating and ventilating, health and safety, and structural requirements for each space. The number of identical spaces was listed on the form.

The relationships among the spaces were shown by schematics (Attachment 8). These relationships had been systematically developed through the use of "bubbles" and "cartoons" in the planning process with the architects (Attachment 9) and the development of the "patterns" discussed below with a consultant. The activities that were to be conducted in the special purpose spaces were described in the application, and outline specifications were included (Attachment 10).

## "Patterns"

SWRL's functional requirements for the facility were included in the application in the form of "patterns." An environmental pattern is an abstract solution to a distinct design problem. Each pattern provided a solution to a problem which could be communicated to any person interested in the construction project. The patterns provided the structure in which the SWRL staff could present their ideas, knowledge and experience in such a way that they could be translated into a physical solution by the architects. Once a pattern was formulated, the architects were able to evaluate the thoughts of the SWRL staff in terms of the physical solutions that would result if the particular ideas were incorporated into the design of the facility.

A consultant was retained to develop the patterns. The consultant reviewed literature in psychology, education, architecture and school planning for solutions to design problems. The consultant also interviewed SWRL staff and management in order to develop patterns for their requirements (Attachment 11). In addition, all material in the custody of the architect resulting from planning efforts conducted before the consultants was examined and expressed in pattern language.

The consultant's final product was a report containing over eighty patterns that were included as a part of the SWRL application (Attachment 12). Each pattern was in the form of an if-then statement with an accompanying discussion (Attachment 13). The "if" was expressed in program terms; the "then" expressed a solution in design terms. Relevant evidence of past research, description of SWRL requirements, and the consultant's field observations were a part of each pattern. Clear statements discussing the pros and cons of various design alternatives were presented as well as a drawing that communicated the design solution in a diagrammatic form.

An additional benefit arising from use of this procedure resulted from a finding that the most efficient way for SWRL staff to participate in the planning of the new facility was to submit their written reactions to the patterns prepared by the consultants in the form of suggested changes and additions to such patterns (Attachment 14). The staff also submitted additional patterns for features that they felt should be incorporated into the building (Attachment 15). Thus staff participated actively in the planning process in a most efficient manner and without the necessity for their expending efforts in preparing drawings to illustrate their suggestions.

Once the schematic plans that were to be included in the grant application were completed, the architects were requested to describe and evaluate the work of the consultant that prepared the "patterns" and the extent to which it would be possible to incorporate the features in the final facility design (Attachment 16). In addition, the consultants were requested to review the schematic drawings prepared by the architect and describe the extent to which the patterns had been incorporated (Attachment 17). The Project Officer was, of course, interested in documenting the extent to which the requirements of the applicant were reflected in the patterns (Attachment 18).

## Review

The procedure set forth in the USOE Guidelines was followed in reviewing the application. The USOE research staff first reviewed the application for completeness and accuracy. A panel of USOE staff, program consultants, and facility consultants then reviewed the application, conducted a site visit and provided recommendations regarding the facility application (Attachment 19). USOE's Research Advisory Council reviewed the application and the site visit team's report and recommendations and made a recommendation for approval to the Commissioner of Education who made the final decision (Attachment 20).

## Working Paper 3

## CONTRACTING IN FEDERALLY-SUPPORTED R&D CONSTRUCTION PROJECTS (TN 1-75-02)

Robert L. Christensen and William H. Hein, Jr.

### GRANT PROVISIONS

SWRL Educational Research and Development received a grant to design, construct, and equip the first facility in the Nation totally dedicated to educational R&D and located on a non-campus site. The scope of work in the grant required SWRL to perform the work and services necessary for the construction of the facility described in its grant application, including architectural and engineering services for the development of plans, drawings, studies and specifications. The grant budget contained a line item for architectural fees. The grant also provided that for any work for which the architect/engineer was to be under contract with the grantee, such contract was to be submitted to the Grants Officer for approval. The use of "Standard Form of Agreement between Owner and Architect" (AIA Document B331) was suggested. The fee was to be negotiated as a lump sum which was not to exceed the prevailing fee for comparable services as depicted in applicable guides published by State professional societies.

The grant further provided that in addition to the terms and conditions of AIA Document B331, the architect's agreement was to provide for assurances of design compliance with all statutory and regulatory requirements and give the architect/engineer authority to reject work which did not conform to the contract documents. Moreover, the contract was to require the architect/engineer to perform specified duties including the preparation of as-built drawings; submission of calculations regarding structural response of the building when subjected to earthquake; assuring that the heating, ventilating, and conditioning system is performed by a specialist; and submitting cost estimates upon completion of each phase of planning. And finally the payment schedule for the architect's agreement was set forth in the grant.

The grant required that all construction contracts were to be awarded on the basis of competitive bidding to the lowest responsive and responsible bidder. This requirement could be satisfied by obtaining three or more bids or by public advertising. Prior to placing an award for a contract, the grantee was to submit the complete procurement file to the Grants Officer for review and concurrence with the required information contained therein. Certain flow-down provisions were to be included in the construction contracts with respect to anti-kickback, equal opportunity, wage rates, and working conditions. The grantee was to be responsible for on-site supervision and compliance with all applicable laws. A full-time resident inspector was to be provided.

## ARCHITECT

Method of Selection. Architectural services are considered professional in nature; therefore competitive bidding is not required as a prerequisite to entering into an architect's agreement. This permits a grantee to prepare its own criteria for selection of the best qualified firm for the particular type of project. In SWRL's case, one of the project's goals was to test new construction techniques in federally-supported construction projects. The criteria, therefore, included the requirements that the architect be experienced in the use of construction-management and fast-tracking techniques and in federally-supported construction projects. Additional criteria were experience in R&D facility design and a documented history of designing facilities that were constructed within budgeted amounts and on schedule.

Certainly the Government construction organization, e.g., FECA, which has responsibility for monitoring the technical aspects of the grant, should be consulted in the selection of an architectural firm that has performed satisfactorily in the past on federally-supported projects of the type to be undertaken. And since the Government Grants Officer will have final approval of the contract with the architectural firm to be retained, it is good practice to have the organization like FECA, that will be providing him with technical advice cooperate in the selection process from the outset.

The amount of the architect's fee may be a consideration in selecting the particular firm to be retained. However, it should not be controlling. Any differences in fees are likely to be small when compared with the considerable savings that can be realized by selecting a well-qualified architect for the particular type of project. Savings can, however, be effected by selecting the architect early enough for consulting services during the planning of the project (before grant award). After grant award, a credit can be negotiated on the architect's agreement for any consultation performed during planning that otherwise would have been performed under a standard architect's agreement.

Form of the Agreement. As stated above, it was suggested in the grant that the agreement for architectural services be in the form of the standard AIA B331 (Attachment 21) with the additional clauses required by the grant. However, since it was decided, subsequent to grant award, that the project would be expanded to test applications of construction management and fast-tracking, it became necessary to use an architect's agreement that made provision for the use of such techniques (Attachment 22). Thus, the relationships and responsibilities of the construction manager are described in the architect's agreement as well as the architect's responsibilities with regard to items such as on-site inspection, off-site engineering, changes to architectural drawings requested by Government agencies and evaluation of contractors. This effectively eliminated all misunderstandings that might have arisen later concerning responsibility for such services as well as the fact that such items were not to be considered extra services.

In a construction management project the Government's Project Officer undoubtedly will have questions concerning the agreement substance which the grantee will have to resolve to obtain the required approval of the Grants Officer (Attachment 23).

Fee. The grant provided that the architect's fee was not to exceed the prevailing fee for comparable services as depicted in applicable guides published by State professional societies. An acceptable method of establishing such fee is through the use of compensation curves for a particular State developed by associations such as the American Institute of Architecture (Attachment 24). Using this technique, the fee is determined by the estimated construction cost and the class or type of facility being constructed. Although easy to apply, this method is limited to establishing the minimum basic fee. Provision must be made in the final fixed fee to compensate the architect for all services required to complete the project. This will, of course, include the additional services required to accommodate construction management and fast-tracking. For example, in construction management the architect will be required to review and evaluate bids from numerous construction contractors from the various trades as contrasted with bids from relatively few general contractors in a conventional construction project. On the other hand, less on-site inspection may be required under construction management than in the conventional project because of the unique role of the construction manager. This would tend to reduce the architect's costs and consequently his fee. The point to remember is that all of the unique factors of the particular project must be considered before executing the architect's agreement to avoid problems during and following completion of the project.

Reporting Relationships. The normal reporting relationship, as set forth in almost all architect's agreements, is solely to the owner. However, where the project is financed by a Federal grant, the reporting relationship will include Federal Construction Officials. Thus, the Government will require that the architect's agreement incorporate by reference the grant terms, which in turn require approval of the architect's work by Federal officials and specified progress reports. In a Federally-funded project, therefore, the grantee should establish a formal working relationship, as early as possible, among the Government representatives, architect, and grantee. Frequent design review meetings should be held with the three parties in attendance. The architect's progress can be reviewed, and changes desired by the grantee and/or Government can be incorporated into the plans and specifications at the earliest possible time. This, in turn, will lessen the probability that the architect will have to re-do work because of changes that could have been specified earlier. Any change has the potential to add significantly to the design and construction costs and should be made as early in the design stage as possible. It should be noted that some changes will result in design services in addition to those provided for under the agreement and will entitle the architect to extra compensation under the terms of the contract.

In a construction management project, the architect's agreement should require the architect to make periodic on-site observations of the general quality and progress of the construction work for conformance with the plans and specifications. In performing these services, the architect should cooperate with the construction manager who has the direct responsibility to the grantee for inspection of the work for compliance with the plans and specifications. It is good practice, therefore, to have the architect's agreement provide that the architect has reviewed the construction manager's contract and will coordinate his services with the construction manager. This cooperation is one of the principal advantages of a construction management project. In a conventional project the general contractor represents his own financial interests and those of his subcontractors in all relations with the architect and owner. In construction management the construction manager represents the grantee-owner, together with the architect, in relations with the various contractors and is not financially affected if work has to be re-done by such contractors to conform to the contract documents.

Even if not required by grant, the architect should be required to issue periodic progress reports to the grantee similar to Attachment 25. This will help ensure that potential design and construction problems are properly communicated, especially those that might have a financial impact on the project. Such reports can be forwarded to the Government's representatives as a practical way of keeping them informed of progress on the project.

It is, of course, extremely important for all contractors who will be performing work on the project to be knowledgeable of the respective authority and relationships among the grantee, architect, construction manager and Federal Government insofar as they might affect such contractors. Ordinarily, these relationships are set forth in the General Conditions which are incorporated into each construction contract.

## CONSTRUCTION MANAGER

Method of Selection. As stated above, the grant requires that all contracts for construction be awarded on the basis of competitive bidding to the lowest responsible and responsive bidder. It is, however, possible to select a general contractor as construction manager, without competitive bidding, so long as such firm performs no construction work on the project. The method that proved to be effective on the SWRL project was for the construction manager to be selected by a committee comprised of the grantee, a Government construction agency representative, and the architect. Each of these parties suggested one or more firms that were experienced in construction management, fast-tracking, and Federally-supported construction. Interested firms were then invited to submit information setting forth their qualifications for the particular project. The proposals should contain the following information as the minimum which is required for evaluation in selecting the successful firm.

- History - principals of firm, annual dollar volume, construction management projects, other projects.
- Organization - organization chart, key personnel, and their responsibilities.
- Method of operation - chronological description of operations from time of contract award through completion and officers or organizational units assigned responsibility for performance.
- Scheduling and control of progress - procedures that will be used to insure that construction schedules are met.
- Cost control and accounting - procedures that will be followed to keep the project within budgeted amounts.
- Former clients and references
- Prior work experience with the Federal Government, grantee-owner and the architect
- Services to be performed as construction manager
- Fee

During the planning stage, the construction manager should work closely with the architect on such matters as budget estimates, cost studies of alternate designs, costs of materials, construction planning, and field surveys of local conditions. Therefore, the success or failure of a construction management project is heavily dependent on the type of working relationship that develops between the construction manager and the architect. And while the grantee-owner need not delegate authority to the architect to make the final decision as to the selection of the construction manager, any well-founded reservations by the architect about a particular firm must be given considerable weight.

Fee. The construction manager's fee is generally determined by applying a percentage, e.g., 3 1/2%, to the final construction cost estimate. This becomes his fixed fee and does not change even though the actual construction costs vary within specified limits. If the construction manager takes the additional risk of contractually guaranteeing that the total cost of construction will not exceed a certain amount, his fee probably will have to be adjusted higher. Such contractual provision is properly known as a "bust out" clause and is becoming more popular in construction management. In deciding whether to incorporate such a provision, the grantee-owner may have to rely heavily on the advice of the Federal officials and the architect. Certainly, it is an advisable feature when the grant funds are limited, and no other funds would be available in the event of an overrun in construction costs.

In addition to the fixed fee, the contract with the construction manager will provide for reimbursement of expenses for persons assigned to the project subject to a stated maximum amount. This would include the field superintendent, project engineer and accounting staff. In addition, the contract will provide for reimbursement of such expenses as travel expenses and long distance calls. The effect, then, is that the construction manager is compensated on a cost for designated items and within stated limits plus a fixed fee.

Form of Agreement. The form of the agreement depends, of course, on the relationship of the construction manager to the grantee-owner, architect, and funding agency. Generally, the agreement provides that the construction manager acts on the project as an agent acting on behalf of the grantee. In such situations, contracts with contractors for the various construction trades are entered into by the construction manager on behalf of the grantee.

The scope of services to be provided by the construction manager will depend on the division of responsibilities with the architect. For example, all duties relating to cost estimating, preparation of bid documents, solicitation of bids, etc., may be assigned to the construction manager with the architect acting in an advisory capacity. In a conventional construction project, the architect might be responsible for all of these functions since only general contractors would be involved. However, in construction management numerous general contracts are entered into with contractors who would be subcontractors to the single general contractor in the conventional project. Thus, the construction manager is more familiar with such contracts and can assume the responsibility in a construction management project.

The agreement with the construction manager used on the SWRL project is shown in Attachment 26. This agreement can be examined in conjunction with the architect's agreement used on the project (Exhibit B) and the general conditions of the construction contracts (Exhibit K) to gain a more complete understanding as to how the duties of these three parties interrelate but do not overlap.

Reporting Relationships. Under the contract used on the SWRL project, the construction manager was responsible to the grantee for all matters relating to construction. In fulfilling this responsibility, the construction manager performed the typical function of a general contractor in supervising, coordinating, and scheduling the work of those contractors that would be subcontractors on a conventional project. This included scheduling of the lead time for the various trades, preparing change orders, arbitrating disputes among trades, accepting or rejecting finished work, etc. On the SWRL project, the construction manager's superintendent also acted as an inspector for the state agency having jurisdiction for earthquake and safety standards for educational facility construction (Field Act).

## CONSTRUCTION CONTRACTORS

Method of Selection. Under the grant, all contracts for construction were required to be awarded on the basis of competitive bidding to the lowest responsive and responsible bidder. The requirement for competitive bidding could be satisfied by obtaining three or more bids or by public advertising. On the SWRL project, the construction manager obtained competitive bids from a minimum of three pre-qualified bidders for the various portions of the project. In addition, public advertisements were placed because of the requirements of State law for public works by State agencies such as SWRL. When pre-qualification is used the criteria must, of course, be fair and free from partiality. A contractor's ability to obtain the necessary bid and contract bonds is prima facie evidence that he is qualified on the grounds of financial and technical capability. Unless, therefore, there is strong evidence to the contrary, his bid should be accepted and considered for award so long as other requirements are met.

An advertised request for bids must be placed in a legally-adjudicated newspaper. The ad must not only contain instructions to the bidders but must also contain the prevailing wage rates for the various trades which will be utilized on the project. A portion of the advertisement utilized on the SWRL project is shown in Attachment 27.

Following the receipt and the opening of bids as set forth in the invitation, the construction manager on the SWRL project made an analysis of the bids received for each category of work, e.g., structural steel, plumbing, etc. His recommendations and the bidding documents were then reviewed by the architect and a Government representative. Once their concurrence was obtained, an approval letter (Attachment 28) was signed by the grantee authorizing the construction manager to execute a contract with the successful bidder. The Grants Officer had approved this procedure. His specific approval, however, was required in any instance where the recommendation was for award to other than the low bidder.

Form of Agreement. Under a construction management arrangement, the general contractors are those that would be subcontractors to the general contractor on a conventional project. Therefore, if the construction manager is a general contractor, the simplest arrangement is to modify his usual form of subcontract to reflect the construction manager relationship and any Federal requirements for the various general contracts.

Reporting Relationships. The contract used on the SWRL project is set forth in Attachment 29. The General Conditions which were incorporated into this contract by reference are found in Attachment 30. These General Conditions set forth the relationships among the participants on the project as well as the procedures to be followed by the general contractors in their relationships with such participants.

## OTHER CONSULTANTS

Method of Selection. In a large scale construction project, there will be a need for various types of professional services. Included are surveyors, materials testers, appraisers, soil analysts, etc. Generally, the firms providing these types of services are selected on the basis of their professional reputations. The architect can probably recommend several firms in each category to the grantee since he works with them on various projects continuously. The Government representative may also be able to recommend firms that have performed satisfactorily on Government projects in the past.

The terms of the Grant will determine what types of approvals will be necessary before a consultant can be retained. In some instances, the grantee alone will be able to make the selection, while in others concurrence from the Government will be necessary.

Form of Agreement. An agreement for professional services typical of those used on the SWRL project is set forth in Attachment 31. Other similar agreements entered into were tailored to reflect the particular type of services requred.

Fees. The fee for the type of services being acquired will be determined primarily by the prevailing rate for similar services within the local community of the project. The architect may be able to provide some assistance to the grantee-owner in ensuring that the rates specified are reasonable for the services to be provided.

Reporting Relationship. Consultant agreements are ordinarily between the grantee-owner and the consultant. It is advisable for the grantee to designate in writing the representatives authorized to act for it under the agreement. This will enhance communication flow and little, if any, control will be lost.

## Working Paper 4

# FAST-TRACKING FEDERALLY-SUPPORTED CONSTRUCTION OF EDUCATIONAL RESEARCH AND DEVELOPMENT FACILITIES (TN 1-72-04)

William H. Hein, Jr.

## Fast-Tracking and Construction Management Generally

Stated most simply, fast-tracking is a set of procedures that permits the various activities involved in the planning, design and construction of a facility to proceed on multiple parallel paths as contrasted with a single linear path. The technique is becoming more common in both the public and private sector, but before the SWRL project, it had not been used in federally-supported construction of educational research and development facilities.

Construction management is an important facet of fast-tracking. Under such an arrangement a construction manager (preferably a licensed general contractor) is retained in a consulting capacity by the owner as early as possible in the planning and design stage of the facility. The construction manager consults with both the architect and owner through planning, design and construction. Among other things, he advises on costs of various design alternatives so that this information is available well in advance of the bidding stage at which time changes in plans and specifications are expensive and time consuming. During construction, he may enter into construction contracts as agent of the owner with firms that otherwise would be subcontractors to a general contractor. Thus, the project may have up to fifty general contracts with various trades and subtrades with the construction process being managed by the construction manager as the owner's agent. The advantages of fast-tracking are immeasurably increased if it is possible to award contracts and start construction in phases as the plans and specifications for each phase are completed.

## Laboratory's Selection by FECA to Use Fast-Tracking and Construction Management

The Laboratory received its construction grant on June 30, 1970. The grant's conditions were those usually contained in one contemplating a singular linear path for planning through design and construction. The experience of four other institutions that received construction grants with similar provisions one year prior to the Laboratory's strongly indicated that probable move-in would be minimally three or four years away. Since SWRL was incurring costs of $100,000 to $150,000 in operations funds for each month of design and construction (rentals in four locations, construction cost inflation, program inefficiencies, etc.), it was clear that appreciable savings of public funds would result if the three to four year period could be shortened.

At the August 1970 meeting of the Board of Directors, Mr. Gerrit Fremouw, Director of Facilities Engineering and Construction, made a presentation describing the advantages of fast-tracking and construction management. He also expressed FECA's willingness to cooperate with the Laboratory in using these advanced techniques in an experiment to ascertain the extent of savings in costs that could be realized. The Board of Directors agreed, and the staff was directed to cooperate with FECA in this effort.

SWRL's project had several features that made it ideal for the experiment FECA wished to conduct. First, the Laboratory was the last of seven institutions to receive its grant. In fact four, including two in California, received grants a year before SWRL. Thus, the base rate provided by these institutions constituted a convenient means of evaluating the more modern techniques. Second, the FECA West Coast Offices are recognized as among the best, if not the best, and most forward thinking in the Country. Third, the Laboratory had engaged an outstanding firm of architects with experience in fast-tracking and construction management. Fourth, there were outstanding construction firms skilled and experienced in construction management in Southern California. Fifth, SWRL's facility, is the only off-campus facility to be constructed solely for educational research and development. Thus, the anticipated success of the new techniques would be even more apparent since there were no precedents upon which to draw for the planning, design, and construction. In addition, the high visibility of the new Laboratory for external audiences would help publicize the cost savings resulting from fast-tracking in educational facility planning, design, and construction. Sixth, SWRL is well-recognized for its efforts in documenting and refining the "how-to-do-it" aspects of research and development in the interests of developing a technology that can be replicated by other institutions wishing to engage in similar efforts. The SWRL mission could without difficulty accomodate new procedures in facility construction (e.g. see Hein and Schutz TM-1-71-3).

## Advantages of Modern Techniques

SWRL's experience with fast-tracking and construction management has conclusively demonstrated their value in planning, design and construction of educational research and development facilities. Using these modern techniques, the Laboratory will move into its new facility well in advance of all six of the other institutions that have received grants. In addition, the project is being completed two months ahead of the original construction schedule, making a total savings in time of between 14 to 18 months. The resulting cost savings in the Laboratory's operations funds are between $1,500,000 and $2,000,000. Moreover, the total design and construction costs were well under the grant award.

Advantages in addition to time savings accrued through fast-tracking result from the fact that the construction manager is not in an adversary position to the owner and architect. In other words, he directly represents the owner as a consultant, not as general contractor representing a host of subcontractors. Since the savings accrued through this relationship are more subtle, they warrant consideration in further detail.

An administrator with experience on projects where the general contractor has a financial interest in change orders increasing the cost of construction cannot help but be favorably disposed toward a situation where the construction manager carries the burden of negotiations with subcontractors over the necessity and cost of change orders. This can be contrasted with the usual arrangement with a general contractor. In disputes arguing whether certain work is included in the plans and specifications, a general contractor frequently adopts the position that the controversy is between his subcontractors and the owner and he, as general contractor, is a neutral bystander. The owner, then, receives no expert help from such a general contractor in attempting to keep construction costs within budget. The situation for the owner is not improved by the fact that a general contractor usually receives a designated percentage of each extra on a change order as an extra fee.

Another advantage of construction management that is particularly important to administrators with experience in dealing with general contractors who are "low bid" is the owner's ability to select the construction manager from a pre-selected list of highly qualified general contractors. In many instances, reputable general contractors will not submit a competitive bid on public work because less qualified competitors will bid below the legitimate cost of the job and be awarded the general contract under the requirements of the law. They will then attempt to make the necessary profit by cutting corners on the project, escalating the costs of change orders and forcing subcontractors to accept subcontracts below the amounts bid by various illegal tactics termed "bid shopping". Needless to say the process is repeated by the subcontractors with the second-tier subcontractors. The owner is then faced with a construction project in which unhappy subcontractors are forced to find cheaper ways of performing their part of the work in order to avoid financial loss. This type of general contractor is not sufficiently concerned with building a reputation for efficiency and good performance to be of much help to the owner in maintaining construction schedules essential for program. On the other hand, a construction manager is dependent for future business solely on his performance since construction management contracts will be awarded to the firm with the best record in managing construction. The myth that a general contractor who is low bid in open competition is necessarily the most efficient contractor and will bring the job in for the least real costs has long since been dispelled among more experienced construction administrators.

Several other advantages result from the fact that a construction manager works with the architect on the plans and specifications from an early stage of design. This makes cost information available to the owner and architect on a periodic basis so that design alternatives can be evaluated on cost data during design rather than after receipt of bids. Moreover, upon completion of the working drawings and specifications, the firm that will manage the project has detailed knowledge of the plans and specifications. This will help eliminate those mistakes in bidding that would be made by a general contractor hurriedly working with plans and specifications that he is seeing for the first time. Moreover, suggestions from a contractor's point of view have been made and incorporated into the plans and specifications throughout design of the facility. And finally, the construction manager, based on his knowledge of the plans and specifications, can be of considerable help in pre-qualifying the contractors who are sufficiently skilled and experienced in performing the various contracts for portions of the work.

## Decision Flow in Fast-Tracking and Construction Management

The cost savings realized in the SWRL project were effected in spite of rather than facilitated by the conditions of the grant award. It is absolutely essential on future projects to work out an efficient and workable flow of decisions among the owner, funding agency, architect, and construction manager in order for fast-tracking to accomplish the maximum savings possible. The following recommendations are based on SWRL's experience in working within a grant framework designed for a flow of decisions to be made on a singular, linear path. In such an arrangement there is insufficient regard for the serious cost consequences that are caused by delays in the entire project while waiting for reviews and decisions on relatively routine matters.

In designing the decision flow, the following principles must be kept in mind by all parties.

1. Any unwarranted delays in arriving at a decision can directly reduce the cost savings achievable in fast-tracking where the completion date is directly or indirectly delayed.

2. All parties must realize that the entire project must be viewed as a complete and single system. Thus, delays in decisions on one part inevitably affect and can delay the entire project. This can be termed recognition of "system integrity" by all parties. In other words, the total project cannot be divided into many subparts and managed as if each subpart were an independent project. An example of extremely poor practice is the dividing up of the total cost of the project into arbitrary "budget lines" and pretending that each is a totally independent item without consequences for the total project. The cost benefits of the modern techniques can be completely lost if any party looks on the project as a series of several independent ones reflected in several budget lines. Moreover, the fact that there are up to fifty general contracts raises the nightmarish prospect of 600 points (50 contracts X 12 budget lines) at which decisions can be postponed, thus delaying the entire project with consequential loss of public funds.

3. In identifying the decisions to be made and specifying the parties to make such decisions, the tendency to assign responsibility without commensurate decision-making authority must be avoided. Unfortunately, many well-intentioned government representatives are inclined to retain critical controls and decision-making authority while assigning total responsibility for the consequences of their decisions to the grantee. Such a practice simply is not tolerable in fast-tracking since an administrator without responsibility for the success of a project will be far more concerned with avoiding minor ministerial mistakes than in insuring the financial success of the project by promoting progress in accordance with schedule. This in turn will paralyze progress and escalate costs. An agency representative retaining decision-making authority without responsibility also tends to require an overkill of data to be submitted for his consideration in making decisions.

4. The project budget should contain a minimum of budget lines. The emphasis must be on total cost of the project rather than on the cost of individual budget lines. Specifying a multitude of budget lines together with maximum amounts that can be exceeded only with specified approvals from remote parties may provide the basis for bureaucratic mental gymnastics, but at the same time it insures dramatic cost escalation resulting from time delays.

5. All decision points designated together with the mechanics specified for obtaining approvals should permit progress to continue on the entire project while the decision is being made. This can be easily accomplished if the suggestions set forth below with regard to decision flow are adopted.

6. All parties must be sufficiently responsive to additional costs and savings being generated as a consequence of the particular construction grant. For example, SWRL was incurring costs in operations funds of $100,000 to $150,000 directly attributible to its facility status for each month it could not move into the new facility. Thus, delays in decisions that delayed completion of the project would have caused appreciable loss of public funds.

7. It should be realized that a general contractor has a great deal of latitude in the internal management of a construction project. A construction manager must have comparable latitude. The decision flow for construction management should, therefore, avoid a tendency to treat the fifty or so general contracts as fifty separate projects to be "controlled and managed" by representatives of the funding agency.

8. The decision-making authority of the funding agency must be assigned to persons who are trained and experienced in design and construction and who are in day-to-day contact with the project. To do otherwise requires the amassing of an undue amount of information merely to bring a remote decision-maker up to date. Moreover, if he understands little about design and construction the task is immeasurably complicated.

RECOMMENDED DECISION FLOW

With the above eight principles in mind, a workable decision-flow is set forth below.

| Activity | Preparation of Information | Review and Recommendation for Approval | Final Approval |
|---|---|---|---|
| 1. Functional specifications | Owner, architect, consultants to owner | Outside consultants (program oriented) | Funding agency staff (program oriented) |
| 2. Total budget costs | Owner, architect, consultants to owner | Funding agency staff (architectural design and construction oriented) | Funding agency staff (construction cost oriented) |
| 3. Selection of construction manager | Owner and architect | Owner and architect | Funding agency staff (construction oriented) |
| 4. Plans and specifications | Architects | Owner | Funding agency staff (architecturally oriented) |
| 5. Prequalification of subcontractors | Construction manager | Architect | Owner (constrained by total budget costs) |

| | Activity | Preparation of Information | Review and Recommendation for Approval | Final Approval |
|---|---|---|---|---|
| 6. | Awards of contracts after competitive bidding | Construction manager | Funding agency (construction oriented) contracts officer (for compliance with grant) | Owner |
| 7. | Progress payments to contractors | Construction manager | Architect | Owner |
| 8. | Change orders (within scope of project) | Construction manager | Architect and funding agency (construction oriented) | Owner |
| 9. | Change orders (outside scope of project) | Construction manager | Architect, funding agency (construction oriented)and owner | Funding agency (program oriented) |
| 10. | Acceptance of contractors' work and release of retentions | Construction manager | Architect, funding agency (Construction oriented) | Owner |
| 11. | Job audit | Construction manager and architect | Funding agency (construction oriented) | Granting authority |

This decision flow incorporates all of the principles set forth above. Most importantly it assigns decision-making authority to those parties who are responsible for the success of the respective activities. The project manager in the funding agency acts principally as a coordinator or expeditor of activities by other persons with specialized knowledge in the required areas. His main activity would be to keep the project running by obtaining necessary federal approvals in the most expeditious manner.

## Summary

The SWRL fast-track project has been extremely successful in spite of the existence of a decision flow that was designed for a linear type of planning, design, and construction process. Considerable savings of public funds have been realized because of the foresight of HEW-FECA in seeing the possibilities of the more advanced techniques in construction of educational research and development facilities. The Laboratory's architect and construction manager and the West Coast FECA personnel demonstrated great patience and cooperation in meeting together periodically through the design stage to resolve potential problems before they became incorporated into the plans and specifications. The California OAC checked and processed the plans and specifications in about one-fourth of the time desired in the interests of validating these modern techniques. The project officer and grants officer, although burdened with a decision flow mechanism designed for other purposes and consequently inappropriate for the SWRL project, did all in their ability to insure continued progress throughout the project. Without the contribution of any of the above, SWRL could not have moved into its new facility until 12 to 18 months after the actual move-in date. The savings in public funds resulting from these persons' efforts will result in direct cost benefits to the taxpayer. They will also result in better instructional products reaching the nation's classrooms earlier than would have been possible under the traditional methods of constructing educational facilities.

## Working Paper 5

## BUDGETING IN FEDERALLY-SUPPORTED CONSTRUCTION MANAGEMENT PROJECTS (TN 1-72-06)

William H. Hein, Jr.

### Need for Modified Procedures by Grantee and Funding Agency

It is helpful to first understand the discussion of construction management as used in a fast-track situation in TN-1-72-4, Fast-Tracking Federally-Supported Construction of Educational Research and Development Facilities, February 18, 1972, before reading this document. As explained in that paper, construction management is essential for fast-tracking to be effective. The preparation and interpretation of the construction budget must recognize the unique characteristics of construction management. The purpose of this paper is to clarify these budgeting matters.

The chief source of confusion for persons accustomed to budgeting for general contract construction can be avoided by recognizing the following key distinction of construction management. If the contract with the construction manager does not stipulate that he guarantees a maximum construction cost total, the documentation of construction costs will be received by the grantee in the form of a written estimate prepared by the construction manager. The grantee, then, has an additional responsibility to verify this estimate in lieu of the total specified in a general contract. The verified estimate will, in turn, be used by the funding agency to prepare the line-item budget.

This fundamental difference between construction management and general contract is well understood by persons experienced in construction budget preparation. However, persons without adequate knowledge of construction management have been known to disregard the verified estimate of the construction manager in favor of a line-item budget based solely on the total of the unanalyzed low bids received for various portions of the work. Such a budget has no validity under either construction management or general contract. In construction management it leads to the totally erroneous inference that there are "cost overruns" when in fact the project's cost is considerably below the true budget total. An actual case of such faulty inference is cited in Attachment A.

### Estimating Total Construction Costs; Documentation from General Contractor

A construction manager and a general contractor follow the same basic procedures in preparing their estimates of the total costs of construction projects. Following the receipt of bids from other contractors for portions of the work, both parties utilize their specialized knowledge of construction practices to identify those costs not included in the bids of the other contractors. There are several reasons why all costs are not included in the bids received. First, specific exceptions are often made by bidders in their bids to certain of the work included in the plans and specifications.

Second, there are further exceptions implied by the practices of the trade that are well recognized by persons engaged in the construction industry. Every experienced general contractor is well aware that it will be some time after opening of general bids before he can complete his analysis and negotiate accurate, written subcontracts with all of the subcontractors. In other words, he cannot ascertain for some time after the opening of the general bids, each specific item for which he will be contracting outside the listed subcontracts. A great many sub bids are frequently received by a general contractor by telephone only a few minutes before the bid opening, and he has insufficient time for the required analysis. Therefore, he will have to add estimated additional amounts (allowances) for the above-described items to total of the bids received and submit the grand total as his bid for a general contract. The work that is included in the plans and specifications but is not covered by subcontracts will have to be performed by his own forces or by other firms with which he contracts.

Two important differences between construction management and general contract should be mentioned at this point. The first is that under general contract, change orders are not required for all of the work required by the plans and specifications but not included in the bids received. However, as explained below, under construction management change orders are necessary for such work. The second distinction is that under general contract, any savings in estimated allowances for such items belong to the general contractor; under construction management, they belong to the grantee and consequently to the funding agency.

From the foregoing, it is apparent that under a general contract, the only important documentation required by the grantee and funding agency of the estimated total construction cost is the amount of the general contract. An estimated contingency for essential change order work that was not included in the final plans and specifications can then be added to this amount, and the total constitutes the budget total for construction.

## Documentation from Construction Manager

There are two principal types of contractual arrangements possible between an owner and a construction manager. In the first, the construction manager will be required to guarantee, by contract, that the construction costs will not exceed the total figure negotiated between him and the owner. In this case, the construction manager will require a larger fee to cover the added risk. In the second type of contract, the construction manager is not required to guarantee the total costs of the project, and his fee is smaller. (This method was selected for the SWRL project in order to save the costs of the additional fee.)

The above distinction is important in that it affects the type of documentation required of the construction manager by the grantee and funding agency in order to determine total construction costs. In the first situation the documentation of estimated total construction costs is similar to that under general contract. That is, there is a guaranteed total amount specified in a binding contract with the construction manager, as is the case under general contract.

Under the second contractual arrangement, the grantee and funding agency rely on a written document prepared by the construction manager setting forth his estimate of the total costs necessary to perform the work required by the plans and specifications, (e.g., see Attachment 32). Since no single party is bound by contract to guarantee a maximum total cost of the construction, additional safeguards are in order to insure that the grant amount is sufficient to cover the total amount of the project. An effective method is to have the construction manager's cost estimate reviewed by other experts in costs of construction. The best and most qualified is the project architect since he has in-depth knowledge of the functional specifications, plans and specifications and can ascertain those costs not included in the documentation from the construction manager, (see Attachment 33). The written estimate and architect's review may also be reviewed by technically-qualified personnel in the funding agency (FECA).

## Preparation of Line-Item Budget

If funding agency officials so wish, they may administratively divide the total construction and other costs into multiple budget lines. However, in both construction management and general contract, these line item totals should only be used for administrative or accounting purposes, and spending controls should be imposed only on total costs. To do otherwise impedes progress on the entire project, and the grantee is required to furnish unreasonable amounts of relatively-useless information for routine administrative transfers among the budget lines. Further, it seems to encourage a regrettable situation whereby certain agency officials attempt to limit costs in a single category even though the total of all categories is less than the grand total ascertained as above. This paralyzes the ability of the parties to effect any savings of public funds through fast-tracking and in fact results in appreciable losses because of delays resulting from requests for information followed by requests for the same information arrayed in a different form.

## Budget Refinement After Bid Openings - Construction Management

Because he has been working with the architects, owner, and architectural-engineering staff of the funding agency throughout the design of the facility, the construction manager is in an excellent position to estimate accurately the total construction costs of the project once the working drawings and specifications are completed. This estimate (see Attachment 32) together with the architect's review (see Attachment 33) allows the grantee and funding agency to satisfy themselves before construction commences that the project cost will be within the grant total.

A complete analysis by the construction manager of the bids received for various portions is essential in order to ascertain the lowest responsive bid in each category and to identify which items of work required by the plans and specifications were not included in the lowest responsive bids. Under fast-tracking and construction management adequate time for this analysis can be taken without impeding progress on a fast-track schedule. The bids for the preliminary work can be analyzed first and contracts awarded once the construction manager has compared the amounts of bids in all categories with his earlier estimates and can assure all interested parties that the project can be completed within his earlier estimate total. As the analysis progresses, the construction manager is better able to estimate any anticipated savings. In the SWRL project the estimated total cost was reduced by $150,000 just after the bid opening. This newer figure can become the new budget total. It can be adjusted further as contracts are awarded and the job progresses, so long as the total construction cost, as determined above, is not exceeded.

During his analysis of the bids, the construction manager meets with each low bidder individually before award to insure agreement on the items of work covered by such bid, (Attachment 34). This effectively eliminates many potential disputes with contractors that can otherwise arise during construction and result in additional costs or crippling delays. It also refines the construction manager's knowledge of what additional work, if any, must be "purchased" outside the contracts awarded to the bidders. This process of construction cost refinement continues throughout construction.

As the job progresses, change orders are initiated for the work that was excluded by the bids from contractors but is required by the plans and specifications. Such costs are financed from an "allowance" in the construction manager's estimate. Most certainly these allowances are not "additional costs" as the term is used in a general contract situation where all change orders affect the total construction costs. Other change orders that are "additional costs," will, of course, also be issued under construction management, as well as general contract, for work not included in the plans and specifications but essential to complete the project. (E.g., changed conditions in site). The latter type of change order can be financed from a "contingency" line item in the budget. Therefore, under construction management there will be numerically more change orders but less total construction costs.

Another savings realized by the grantee and funding agency in construction management over general contract results from the fact that the costs of change orders will be less for the same item of extra work. Under both general contract and construction management, administrative and profit costs are added by each tier of contractor through which any change is processed. By carefully scheduling the item of award of change orders, a construction manager can negotiate for the best possible price and then award contracts to subcontractors directly (second-tier subcontractors under general contract) without going through the contractor. When this is possible, the additional costs of the contractor are eliminated. Moreover, the additional costs added to all change orders by a general contractor are not incurred under construction management eliminating much of the "pyramiding" of costs of change orders that would result under a general contract.

## Summary

As stated in TN-1-72-4, the SWRL project was an experimental one to develop and document replicable procedures in construction management for use in similar federally-supported projects. It was extremely fortunate that Turner Construction was willing to act as construction manager. Not only have field personnel done a superb job in managing construction so that true costs are considerably under original estimates of total costs, but also the project will be finished ahead of schedule (Attachment 35). The processes used by construction manager and architect have been carefully documented and made available to the Federal Government at no additional cost, (e.g., construction contracts modified for construction management; Field Operations Manual).

From what has been learned on the SWRL project, funding agency personnel should now be in a position to modify their procedures and decision-flow to accomodate construction management beginning with the Guidelines and Applications Procedures for the Educational Research Facilities Program (draft) USOE November 1967 through grant of application and administration of construction processes. The potential for considerable savings of public funds on future projects by truly fast-tracking the entire planning, design, and construction processes will be available as soon as this is done. SWRL and its consultants are most appreciative for being given the opportunity to participate in this cooperative effort with FECA and USOE.

## Working Paper 6

## COMPLIANCE AUDIT OF FEDERALLY-SUPPORTED EDUCATIONAL R&D CONSTRUCTION PROJECTS (TN 1-73-02)

William H. Hein, Jr.

### Background

SWRL Educational Research and Development received a construction grant dated June 30, 1970 in the amount of $4,286,000 to plan, design and construct the first non-campus facility constructed solely for educational research and development in the Nation (Hein and Schutz 1971). In August, 1970 USOE, FECA and the SWRL Board of Directors agreed to test two new construction techniques known as construction management and fast-tracking on the project. The success of the experiment is well demonstrated by the fact that design and construction were completed 16 to 27 months sooner than the other six institutions receiving grants. So also the OMB has confirmed FECA's estimates of cost avoidance of $15,041,000 resulting from use of new techniques as well as federally-owned land in the project (Hein, 1972).

All parties realized in August, 1970 that the grant had been written under the presumption of a general contract for construction with its traditional linear procedures as contrasted with construction management and fast-tracking. If SWRL had then insisted that the grant be re-written before proceeding, all potential savings would have been eliminated before the project started. Therefore, SWRL undertook an endeavor unique in Federally-supported construction, namely to comply with a grant written for a general contract and at the same time act responsibly so as to give the new techniques a fair trial.

An important feature of all activities at SWRL is the careful documentation of the events, as they occur. The fact that this principle was carefully followed in the SWRL experimental construction project proved to be extremely important in view of the following sequence of events that affected the audit.

1. For a variety of reasons, including personnel turnover, NCERD failed to take action on SWRL requests for administrative adjustments within project grant total among the various budget categories. Then when SWRL repeated its requests for approval, it would be required to re-array all cost information previously submitted into a different form and resubmit it for approval. The whole process would then be repeated without either approval or disapproval of the many requests ever being received.
2. SWRL finally referred NCERD's delays in acting on the requests to USOE contract officials, who gave specific assurances that immediate action would be taken if SWRL would again resubmit all previously-furnished cost information in a summarized form. SWRL complied and furnished all past cost information in the newest form.
3. Several months after the SWRL submittal of the re-arrayed cost information, the USOE contract officials telephoned and informed SWRL that they would delay taking the action until completion of the audit of the construction grant.

4. The objectives of the audit were changed several times both before the entrance conference and during the field work without notice to SWRL.

5. No member of the audit team had any training or experience in auditing a construction management project or a research and development institution.

6. The field auditors treated NCERD's year long refusal to take action on cost information as a grantee failure to obtain required approvals.

7. Following a turnover in personnel, NCERD began to ignore all experimental aspects of the construction project and treated it as if it were a traditional construction project. The auditors accepted this position and rejected all documentation to the contrary including that of Contracts and Grants officials (Attachment 36). Indeed there was no mention of the word "experimental" or one of similar import in any of the audit reports.

## Audit Characteristics

A grantee of an experimental construction project must have documentation that is responsive to characteristics of agency audits:

1. While agency auditors feel they are "impartial" to both the grantor and grantee in the conduct and reporting of a compliance audit, their reports are unbalanced in that no evaluations of the granting agency's actions are set forth in their report. This reporting practice places sole emphasis on criticism of the grantee.

2. In an experimental construction project, it is probable that the designated audit team will not have the essential experience or training necessary for a compliance audit.
3. Audit reports in compliance audits may emphasize only the negative aspects of the grantee's administration of the grant and totally exclude consideration of the savings realized.
4. Agency auditors may not accept the "system integrity" of a construction management project. Thus, they may ignore the potential cost savings on the total project and treat each administrative budget category as if it were a separate project.

## Grantee Documentation

The agency audit characteristics described in the previous section make it incumbent on the grantee of an experimental construction project to carefully prepare for the compliance audit by the agency's auditors. Failure to take the steps described below could result in inaccuracies and unfairness in the conduct of and distortion in the reporting of the audit. The grantee's task will be immeasurably simplified when agency auditors comply strictly with the terms of GAO Standards for Audit of Governmental Organizations, Programs, Activities and Function (1972) that codify for the first time the longstanding ethical and professional standards of audit. Previously a grantee had no written authority setting forth the standards that were required to be followed on all audits.

It is suggested that the grantee of an experimental construction project obtain a set of these standards from the General Accounting Office and become familiar with their contents immediately upon grant award. Then the conduct of the audit should be carefully documented by memos to the file and referenced to the appropriate standard(s). If this is carefully done the grantee will be in an excellent position to quickly prepare expressive responses to those aspects, if any, of the audit that resulted from its being conducted or reported in contrary to GAO Standards (Attachment 37).

## Audit Entrance Conference

There are several types of audit recognized by the GAO Standards (e.g., financial, compliance, and management). At the entrance conference, the grantee should insist on written agreement as to the scope of the audit to be conducted including the answers to the following questions.

1. Which of the grantee's operations will be audited, for which period?
2. What type of audit will be made for each of the areas of activities?
3. What law, regulations, guidelines, contract provisions and grant clauses will be controlling? In case of conflict or ambiguity which will be given precedence?
4. Do the members of the audit team have the necessary qualifications for the operations they will be auditing? If not, what technical consultants within or without the Federal Government will be utilized?

5. Will the deficiencies of the funding agency be treated in the report? If not, will this feature be set forth clearly in the resulting report?

6. Will the experimental nature of the construction project be treated formally or ignored in the conduct and reporting of the audit? If it is to be ignored, will this fact be set forth clearly in the report?

7. Will the auditors observe [illegible] management perspective in the conduct and reporting of the audit? Or will they follow the usual practice of treating each administrative budget category in the grant as if it were the only matter with which the grantee had to be concerned in total disregard as to its effect on the total project and all other operations?

8. Will the auditors make the funding agency's written request for audit available to the grantee? How will the auditors insure that they have received accurate and complete information from the grantor?

Because of past experiences with agency auditors, a grantee might be understandably reluctant to request that the above matters be clarified at the entrance conference. That is, the grantee could feel that the auditors would consider the questions presumptuous thus alienating the auditors at the outset. There is, of course, some risk of this happening. However, there is a greater risk that in the absence of such precautions any noncompliance with the GAO Audit Standards will result in an unfair audit and a distorted report to the detriment of the experimental project. In addition, there is no valid reason why agency auditors should be offended if asked to show how they intend to comply with the standards of their own profession.

### Auditor's Field Work

The auditor's field work is also governed by the GAO Standards as follows:

> GAO Audit Standard: "Sufficient, competent, and relevant evidence is to be obtained to afford a reasonable basis for the auditor's opinions, judgments, conclusions, and recommendations."

The grantee of an experimental construction project should carefully document all audit practices observed during the conduct of the field work that appear to conflict with GAO's standards.

### Auditors Draft Report

The draft report is usually the first opportunity for a grantee to respond formally to the auditor's tentative findings. Although it is laborious and time-consuming, an effective method of response is a "line by line" analysis of the tentative report (Attachment 38). Then a summary of the findings of this type of analysis can be prepared and submitted in further response to the draft report (Attachment 39). In SWRL's audit it quickly became evident in the preparation of the responses that although the draft reports were quite lengthy they were in fact based on only four points that were repeated throughout the report in many different forms. Where this is the case, a further "analysis of the analyses" can be prepared and submitted in response to the reports (Attachment 40). Then depending on the time available for response and the extent of previous preparation, an acceptable audit report from the grantee's perspective can be prepared and submitted to the auditors (Attachment 41). And finally, if the auditor's statement of facts is in dispute a statement of facts from the grantee's perspective can be prepared (Attachment 42).

Following receipt of the grantee's response to the proposed final report, the agency auditors will make any changes in the report they feel are warranted. If the changes are substantial, the grantee will be given the opportunity to modify its response. An exit conference is then held at which time the proposed final report and grantee's response are discussed (Attachment 43), and an attempt is made to reach agreement on any remaining differences.

## Final Report

The final report will consist of the auditors' findings, the grantee's response and the auditors' rebuttal to this response. The GAO Audit Standards require the report to be in writing and submitted to the appropriate officials of the organization requiring or arranging for the audit. The fact that the GAO Audit Standards also provide that audit reports should be made available for distribution to or inspection by interested members of the public makes it especially important that the grantee insure that the conduct and reporting of the audit be in strict compliance with GAO's Standards. Where this is not the case, the documentation described above will provide the grantee with an adequate basis for having the report declared null and void and consequently unfit for public disclosure. Moreover, an appeal to the General Accounting Office could be considered appropriate (Attachment 44).

## Summary

The principal objective in an experimental construction project is to determine the cost savings that would result from the use, by other grantees, of the practices and procedures shown to be more economical and efficient than existing ones. Agency auditors may claim that their chief concern is the conservation of public funds. However, under their present mode of operation, they concentrate their total efforts on the possible loss of insignificant amounts and ignore the appreciable savings that have actually resulted. For example, on the SWRL audit the auditors refused even to consider the experimental nature of the project or to mention the $15 million of cost avoidances computed by FECA and confirmed by the Office of Management and Budget.

Until agency audit reform in the form of strict compliance with GAO's Audit Standards becomes an accepted practice, the grantee has the added responsibility of becoming knowledgeable of the provisions of GAO's Audit Standards and carefully documenting all violations thereof by the agency auditors. This documentation should then be summarized and become a part of the grantee's report to all interested parties. Regrettable as this may be, it is an essential task to insure that the large savings possible from use of the new techniques is not lost because of longstanding, albeit archaic, audit practices in the conduct and reporting of agency compliance audits. Even with the enactment of the new GAO Standards, grantees of experimental construction projects will be afforded protection against outmoded audit practices only to the extent warranted by their documentation practices.

Recommendations

SWRL's experiences with the compliance audit by agency auditors of its experimental construction project provide the basis for the following recommendations concerning future experimental construction projects.

1. Private CPA firms should conduct the compliance audits until such time as GAO Standards are being strictly adhered to by agency auditors.
2. The criteria for selection of the private CPA firms should include an ability to utilize a management perspective in the audit in order to ascertain the true savings in public funds that could be realized by use of the new techniques.
3. No person who participated in prior administrative consideration, or in the preparation or presentation of a request for audit, should advise or consult with, or make an ex parte communication to the audit team unless

the grantee is given notice of such advice, consultation or communication, and reasonable opportunity to respond.

4. Auditors, agency or otherwise, should be required to observe the letter and spirit of the Freedom of Information Act (federal legislation) and not withhold information of a public nature from the grantee, as for example the agency request for the audit.

## Working Paper 7

# REVIEW OF FINAL REPORTS OF COMPLIANCE AUDITS OF FEDERALLY-SUPPORTED EDUCATIONAL R&D CONSTRUCTION PROJECTS (TN 1-74-03)

William H. Hein, Jr.

## Background

This paper extends the information in TN 1-73-02 (Hein, 1973) which describes the nature of the documentation desirable during the course of an experimental construction project funded by a Federal grant to insure a fair and accurate federal compliance audit. The agency audit characteristics described in TN 1-73-02 create a high probability that the audit reports of experimental construction projects will contain recommendations adverse to grantee/contractors. Grantee/contractors, however, are not without remedy since they may dispute the auditors' recommendations and refer the matter to the Grants and Contracting Officers for their review and determination. Contracting and Grants officers have sufficient authority to take whatever remedial action is warranted with regard to the auditors' recommendations. For example, in SWRL's case, following the issuance of a proposed audit report, the NIE Grants Officer acted favorably on year-old requests for adjustments among the grant's budget categories previously ignored by other Federal officials. This resolved most of the auditors' tentative recommendations for cost disallowances prior to the issuance of their final audit report (Hein, 1973). However, the NIE Contracting Officer agreed with the auditors' recommendations in their final report and issued a final decision to that effect. This decision was appealed in accordance with the terms of the contract. In relying on SWRL experience for example, much of the following discussion is concerned with review procedures under the Disputes Clause of a contract. Nevertheless, the basic procedures are equally applicable in obtaining review of the report of an audit of a grant where a grant appeals board has been established.

## Contractor's Activities Following Auditors' Final Report

The auditors' final report will consist of their findings, the contractor/grantee's response and the auditors' rebuttal to this response. The GAO Standards for Audit of Governmental Organizations, Programs, Activities and Functions (1972) require the report to be in writing and available for distribution to or inspection by interested members of the public. Following the issuance of this report, the auditors' task is complete, and responsibility for taking action on their recommendations is assumed by the agency requiring or arranging for the audit.

The auditors' covering letter directed SWRL to make a "reply to the report" to such agency. The form and contents of the "reply to the report" were unspecified, and no instructions existed that provided any guidance. In this instance, additional uncertainty was introduced by the fact that the audit report covered both a contract containing a Disputes Clause and a grant without such clause. SWRL's reply, then, consisted simply of a rebuttal to the report itself. Subsequent events indicated that it would have been much more effective, from the Contracting Officer's perspective, for SWRL to have immediately treated the matter as a dispute under the contract and submitted a reply in the form of a claim against the Federal Government.

## Role of Contracting Officer

While no specific form is required for the actual claim document, to be convincing and persuasive, it must be in writing and present every facet of the dispute which favors the contractor's position. It should also discuss, and attempt to overcome, any of the Government's known negative conclusions (The Government Contractor Briefing Papers, 1968). It should be attractive, logically organized and easily reviewable. Generally, and as a minimum, it should contain:

(1) A narrative factual statement of the claim, in as much detail as necessary to persuasively present the contractor's views.

(2) Quotation of key documents and contract clauses.

(3) A discussion of the legal and contractual basis of the claim, showing why the facts presented entitle the contractor, as a matter of law, to the relief sought.

In federal procurements generally, a "dispute" exists whenever the authorized Government representative and a contractor express opposing views or assert opposing claims (California Continuing Education of the Bar, 1961). Thus, when a contractor disagrees with auditors' recommendations and the bases therefore, a "dispute" has arisen. The controlling provision in the SWRL contract regarding resolution of such disputes provided as follows.

Clause No. 2 - DISPUTES

> (a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting

> Officer shall be final and conclusive unless within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the Secretary. The decision of the Secretary or his duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.
>
> (b) This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in paragraph (a) above: Provided, that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

Under this clause, the Contracting Officer's role is crucial in the disputes-resolving process. It is his duty to avoid disputes whenever possible; to attempt to settle disputes by negotiation after they have arisen; and, if negotiations should fail, make the initial decision for the Government on the dispute. In this role, the Contracting Officer inherently acts in a dual capacity. He is an agent of the Government charged with the responsibility of administering the contract, which inherently makes him the Government representative in any dispute, yet concurrently he is legally required to act independently and impartially in resolving disputes. This dual capacity can be extremely confusing to contractors since they are never sure, in discussions with the Contracting Officer, as in which capacity he is acting (Report of Commission on Government Procurement, 1972).

As a general rule, it is in the interests of both the Government and the contractor to settle all disputes amicably before resorting to other remedies available to either or both parties (Paul, 1964). The fact that 38% of all cases brought to appeals boards are settled has led eminent authorities to recommend more effective settlement efforts at the contracting officer level (Report of Commission on Government Procurement, 1972). In this connection, it is appropriate for the contractor to take the first steps in attempting to reach settlement with the Contracting Officer. It should be remembered that the Contracting Officer will settle a claim only when he is convinced that such claim is sufficiently sound to persuade an appeals board to find for the contractor on review. Consequently, a contractor's claim documentation should provide a permanent record that would justify any settlement made by the Contracting Officer so that he will be protected in the event of review of his action by superior authorities (within or outside his agency). Indeed, the record should not only support the request, but should also demonstrate that its denial would be unfair and contrary to the Contracting Officer's duty to allow justifiable contract claims (The Government Contractor Briefing Papers, 1968).

There are, of course, occasions when it is not possible to negotiate or to compromise differences. In such case the Contracting Officer may, as a preliminary step, issue written findings based on his understanding of the complete record of facts (Attachment 45). This permits the contractor/grantee an opportunity to provide additional documentation as to the allowability of any costs questioned before the issuance of a formal Contracting Officer decision pursuant to the Disputes Clause of the contract (Attachment 46).

Under HEW regulations, the Contracting Officer's final decision is to include a simple and concise statement of (1) the claim, (2) the decision, (3) the findings of fact which support the decision, and (4) the reference to the Disputes Clause (41 CFR 3-1.318-50) (Attachment 47). The failure of a Contracting Officer to include a statement of "finality" of his decision and notice to the contractor of his appeal rights has been held to preclude a decision of a Contracting Officer from being "final" for the purposes of computing the time for filing a 30 day period appeal (Curtis-Wright Corp., ASBCA No. 6279). In issuing the formal decision, the Contracting Officer is required to state his position with the assistance of General Counsel (41 CFR 3-1.318-50). Once the final decision has been issued, a copy is to be furnished to the contractor by certified mail, return receipt requested (41 CFR 3-1.318). A presumption arises as to the validity of a Contracting Officer's final decision (Paul, 1964). A recent authoritative study on the subject shows that 6% of the contractors engaged in a dispute obtain favorable findings of fact and decisions at the contracting officer level (Report of the Commission on Government Procurement, 1972).

## Contractor's Activities Following Contracting Officer's Final Decision

Under the standard disputes clause quoted above, the decision of the Contracting Officer becomes final and conclusive as to all questions of fact unless the contractor mails or otherwise furnishes to the Contracting

Officer a written appeal directed to the Department Secretary. The decision on questions of fact by the Secretary or his duly authorized representative for the determination of such appeals is final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, capricious, so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. By regulation, the Armed Services Board of Contract Appeals has been designated as the representative to hear, consider and determine appeals by HEW contractors under the Disputes Clause in contracts (41 CFR 3-1.318-51). In addition, HEW has established a Department Grant Appeals Board to review and provide hearings on post award disputes arising in the administration of certain grant programs (Attachment 48). Almost one-half of the adverse decisions of Contracting Officers are appealed, and contractors achieve some success in 57% of the cases appealed, including settlements in 38% (Volume 4, Report of the Commission on Government Procurement, 1972).

Should the contractor decide to appeal the final decision of the Contracting Officer, an original and two copies of a timely notice of appeal is to be filed with the Contracting Officer (Attachment 49). There is no special form to be followed in preparing a written appeal; however, the document should clearly state that a present appeal is thereby intended. Thus, it has been held by an administrative board that if the contractor merely expresses disagreement with the action taken by the Contracting Officer, such does not constitute a notice of appeal (Paul, 1964). The notice of appeal should also identify the contract (by number), the department and agency cognizant of the dispute, and the decision from which the appeal is being taken. It should be signed by an authorized representative of the contractor (ASBCA Rule 2). (If desired, the complaint, discussed below, may be filed with this notice, or the contractor may designate such notice as a complaint if it otherwise fulfills the requirements of a complaint.)

When a notice of appeal has been received by the Contracting Officer, he is to endorse thereon the date of mailing and within 10 days forward it to the ASBCA with a copy to the Office of General Counsel of HEW (41 CFR 3-1.318.51). Following receipt of the original notice of appeal, the Board is to notify the contractor (Attachment 50), Contracting Officer, and the Office of General Counsel. Also the contractor is to be furnished with a set of the Rules of the ASBCA (41 CFR 3-1.318.51).

Within 30 days of the receipt of the notice of appeal, the Contracting Officer is required to compile and transmit to the ASBCA and the Office of General Counsel of HEW copies of all documents pertaining to the appeal including the following (41 CFR 3-1.318.51):

1. The findings of fact and the decisions from which the appeal is taken and the letter or other documents of claim in response to which the decision was issued;
2. The contract and pertinent plans, specifications, amendments, and change orders;
3. Correspondence between the parties and other data pertinent to the appeal;

4. Statements of any witnesses on the matter in dispute made prior to the filing of the notice of appeal with the Board;

5. Such additional information as may be considered material.

The Contracting Officer then sends the contractor a list of the compiled documents and makes the appeal file available for review at his office or at the ASBCA (Attachment 51). After receipt of the file, the ASBCA is to notify the parties (CFR 3-1.318.51).

Should the contractor, subsequent to filing an appeal, elect nevertheless to accept fully the decision from which the appeal was taken or any modification, written notification of such acceptance is to be given to the Office of General Counsel or Contracting Officer concerned. The General Counsel then gives the necessary notice to the ASBCA (41 CFR 3-1.318.51). On the other hand, the Contracting Officer may modify or withdraw his final decision at any time within the period of appeal and forward his recommended action to the Office of General Counsel together with his file supplemented to support the recommended correction or amendment (41 CFR 3-1.318.50). In addition, whenever it appears that the contractor and General Counsel are in agreement as to the disposition of the controversy, the ASBCA may suspend further processing of the appeal to permit reconsideration by the Contracting Officer (ASBCA Rule 27).

It is advisable for the contractor to retain an attorney, experienced in public contracts, as early in the dispute procedure as reasonable considering the amount in dispute. An attorney is best qualified to prepare the complaint and file it with the ASBCA (Attachment 52). An original and two copies of a complaint must be filed within 30 days after the contractor receives notice from the ASBCA that its appeal has been docketed. Each of the claims must be set out in direct, simple and concise language, and the contractual basis and dollar amount of each must be alleged. Documentary evidence may be included with the complaint. Upon receipt, the recorder of the ASBCA serves a copy of the complaint on the Contracting Officer (ASBCA Rule 6a). Following the filing of the Government's answer (Attachment 53), the remainder of the procedures before the ASBCA resemble those of a judicial proceeding (Attachment 54). Following a day of testimony before an ASBCA Hearing Officer, an amicable settlement was negotiated by the attorneys.

# REFERENCES

1. Compliance Audit of Federally-Supported Educational R and D Construction Projects; William H. Hein, Jr.; Technical Note 1-73-02 dated May 3, 1973; SWRL Educational Research and Development; Los Alamitos, California.

2. Government Contracts Practice, California Continuing Education of the Bar, 1964.

3. Preparing Construction Claims for Settlement, The Government Contracting Briefing Paper, Federal Publications, 1968.

4. Report of the Commission on Government Procurement, Government Printing Office, December 1972.

5. United States Government Contracts and Subcontracts, Jack Paul, American Law Institute, 1964.

## Working Paper 8

# RELOCATING TO A NEW EDUCATIONAL R&D FACILITY (TN 1-75-04)

Robert L. Christensen

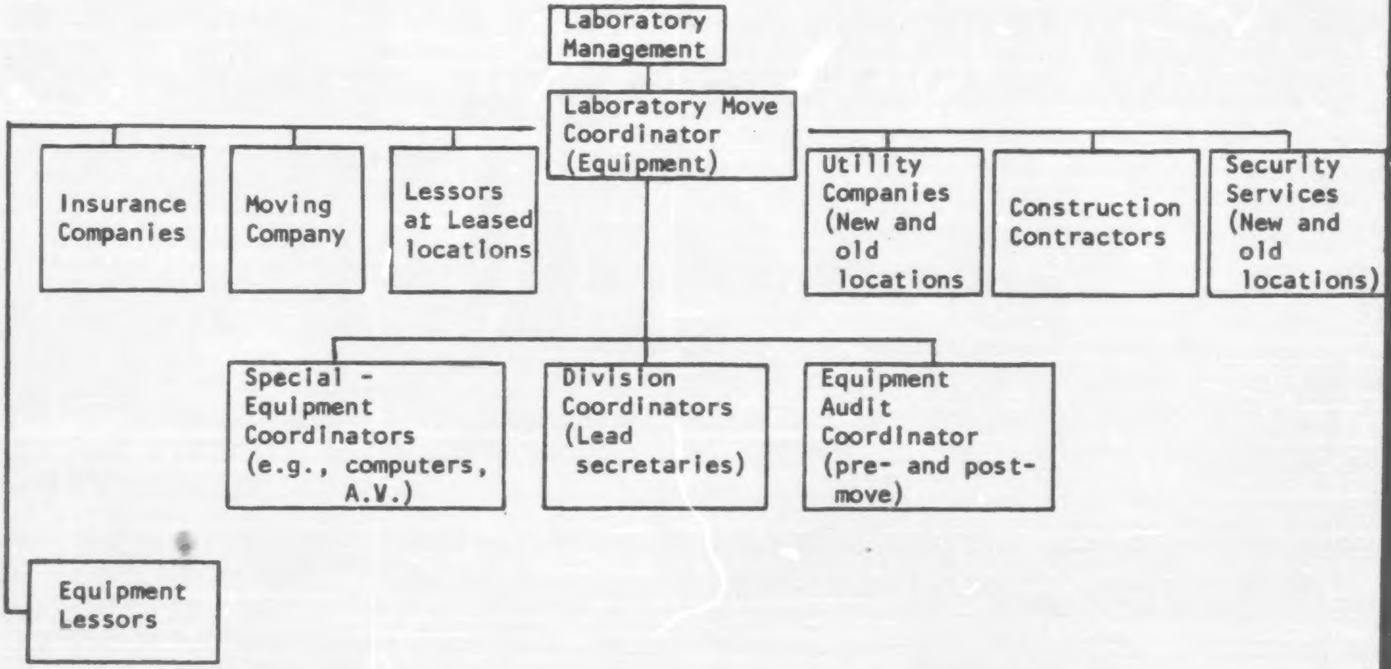
## MOVING EQUIPMENT & MATERIALS

Conducting a large scale move of equipment and materials from four widely-scattered locations to a new facility some distance away is an important undertaking for any institution totally dedicated to educational R&D. Thus, detailed plans for its execution are necessary to avoid unnecessary loss of staff R&D effort and unreasonable exposure to risk of damage or loss of any equipment and materials during the actual move. In addition, moving companies charge for the time that their equipment and personnel are engaged in the project; therefore, all time for the move that is saved by effective planning and execution will be reflected in reduced moving charges. The procedures followed by SWRL Educational R&D in moving its operations from four widely-scattered lease locations to a new facility twenty miles away resulted in its completion without a single day's interruption in program operations or major loss or damage of equipment. These procedures are summarized below.

Staff Assignments - All activities related to the planning and execution of the move of the equipment and materials were coordinated and executed under the supervision of a single SWRL staff member, the Laboratory move coordinator. Consistent with SWRL's modified matrix organization, the Laboratory move coordinator utilized the services of SWRL staff members assigned to the several functional divisions of the SWRL organization.

The key members of the move coordinator's "staff" were the senior secretarial persons of each of the divisions plus members of the administrative services staff. They were assigned responsibility for tasks which could be accomplished at flexible times permitted by their principle duties within a designated time period. For example, the lead secretaries of the divisions were responsible for labeling all equipment items in the division for the movers that were not the direct responsibility of individual staff members. Other tasks of a similar nature were assigned and performed by lead secretaries in addition to their regular duties over the several weeks preceding the move.

The following chart illustrates the functional relationships among SWRL staff and other participants in the move.


Laboratory Management
Laboratory Move Coordinator (Equipment)
Insurance Companies
Moving Company
Lessors at Leased locations
Utility Companies (New and old locations
Construction Contractors
Security Services (New and old locations)
Special - Equipment Coordinators (e.g., computers, A.V.)
Division Coordinators (Lead secretaries)
Equipment Audit Coordinator (pre- and post-move)
Equipment Lessors

As indicated by the chart, the Laboratory move coordinator was responsible for the supervision of SWRL staff while performing tasks related to the move of equipment and coordination of their efforts with outside firms. Division coordinators were responsible for task completion in their divisions. Because SWRL had a great deal of R&D equipment, one of the "move team" was assigned the responsibilities of a "special-equipment coordinator." This person made the arrangements necessary for the transfer of all electronic and other sensitive equipment which required removal, transportation, and re-installation, by specialists. This included the scheduling of electricians and mechanics to disassemble and disconnect the equipment before the move and reassembly and reconnection in the new location. Items that required this special handling were moved either before or after the general move thus reducing the possibility of damage to sensitive equipment or impeding the general move of furniture, materials, etc.

An extremely important task of the Laboratory move coordinator was the translation of the plans for the move into specifications that could be understood and priced by firms of movers submitting proposals for the move (Attachment 55). This required the assistance of a person who was familiar with moving operations early in the planning process. Then once the firm of movers had been selected, through a competitive procurement process, a representative of that firm became a member of the "move team."

Pre-Move Inventory - SWRL, as is the practice of institutions in possession of U. S. Government property, maintains very detailed records of all furniture and equipment under its control. It was, therefore, essential that a complete inventory be taken just prior to the move. This provided a current list of all items to be accounted for in their locations within the new facility following the move. Even the low value equipment items which, by Government regulation and SWRL practice, were not normally included in the inventory records equipment ledger were also identified and recorded at this time. The resulting composite list served as the control document for identifying in advance future locations in the new facility of each item. Moreover, the move labels for all items were prepared from this listing.

Scheduling the Move - SWRL found there were many factors to be quantified so as to have an economic basis for establishing the schedule for the move. It was found that, as the move schedule was compressed into a shorter time frame, the direct cost per item moved increased for several reasons including the following.

1) After eight hours of work, movers are paid a premium for overtime.
2) Movers become less efficient the more hours they work during a continuous period.
3) Less care may be taken in handling the furniture and equipment, as the moving crew becomes tired.

These direct costs had to be balanced against other non-direct costs that would be incurred such as the payroll costs for staff time that would be non-productive for any time that the new facility was not available for the staff on a SWRL working day. One alternative that was considered and rejected, for personnel relations considerations, was to require staff members to take vacation during any working days that the facility was non-available because of the move.

In addition to cost considerations, constraints beyond SWRL's control affected the scheduling of the move. Included were the policies of the landlords in the four leased locations governing movement of equipment within their respective office buildings. The landlords of three of the locations would not allow any equipment to be moved out of their buildings during normal working hours because of the disruption of activities of other tenants. This left nights and weekends as the only time that SWRL could load much of its equipment into the moving vans. In addition, the special equipment had to be disconnected from electrical outlets before the movers arrived but at times that would not delay or interrupt its use on important R&D tasks.

An analysis, based on the above factors, indicated that the SWRL move would be most economical and least disruptive if it were so conducted as to avoid the loss of a single staff working day. The SWRL staff, then, could work their normal time on the Friday preceding the move and report to the new location the following Monday at the start of the normal working day. Since the equipment would be loaded at night and over the weekend, arrangements had to be made for the rapid repair of any elevator that was to be used in the move. This was necessitated by the fact that the costs of the movers would be between $300-$400 per hour.

Selecting the Mover - After the preliminary plans were completed, prequalified moving companies were contacted and requested to submit proposals for the move. Because sufficient planning had been completed, these companies were able to analyze the complexity of the move and ascertain how it could best be accomplished. Selecting the mover at the earliest possible time also had the advantage of allowing its representatives to participate in the planning process and apply their expertise in solving potential problems as they were identified. Several of these problems appeared to be quite simple to the novice in a large-scale move. However, in reality they were quite formidable and required the expert assistance of the moving firm in solving them before, rather than during, the course of the move.

In evaluating the proposals submitted by the different firms, SWRL gave consideration to each of the points listed below.

1) Price. In California, as in most states, the prices that can be charged by moving companies are controlled by law and regulation. The minimum rates that can be charged by moving companies are set which renders ineffective a competitive bidding process under which the award could be solely on the basis of the lowest estimate. While all companies can provide an estimate of the cost, this provides no real protection against an overrun above the estimate. Consequently, the estimate quoted by a mover cannot be considered as the controlling factor.

2) Experience. Each company that submitted a proposal was required to furnish a list of references who could be contacted as to quality of performance on past moves. A great deal was learned about the companies under consideration by contacting those who had direct responsibility for these moves. It was found that the references were candid about the movers' performance and readily described any deficiencies in performance they had noted. It was also possible to determine how much experience the various movers had in moves similar to SWRL's. And finally it was possible to determine the reliability of the cost estimates of the various companies on other moves.

3) Availability of Manpower. Because of the magnitude of the move, consideration was given to the manpower resources each mover had in his organization. Since the move was to be carried out in a compressed time schedule, it was obvious that a small firm with a single crew would have extreme difficulty in performing the SWRL move without unreasonable escalation of costs and disruption of R&D operations. On the other hand, those movers who had access to a sufficient number of crews to permit assignment to both the departure and arrival points would have a much better chance of meeting this schedule and keeping costs within estimates. Therefore all movers who were not able to support a round-the-clock effort at both loading and unloading points were eliminated from consideration for the job.

4) Type of Equipment. An analysis was made of amount and type of equipment that each bidder could dedicate to the job. The moving company finally selected was found to have access to the proper type of equipment necessary to meet time and cost requirements. For example, the movers selected were able to furnish book carts for the move of the library which made it unnecessary to pack the books in cartons. In addition special carts were furnished for office machines, etc.

Layout of Floor Plans. The movers preparing proposals were given a comprehensive set of floor plans for both the old and the new facilities. Each equipment item was tagged with a location or address keyed to spaces identified on the floor plans for its present and future locations. In addition, since the SWRL organizational divisions that were located as units in the old locations were to be relocated as units in the new facility, the two sets of floor plans were color-coded to assist in coordinating the loading operations. Thus, the space for a division on the plans for the old and the new locations was shaded with the same color. This permitted the loading of individual moving vans with items having the same floor plan color code. The successful moving firm was able to unload in bulk at staging areas within the respective color zones in the new facility. The items were then distributed to the individual rooms designated on the move labels. Had these color code procedures not been utilized, the move would have taken considerably longer because the mover would have been required to determine where each individual item being unloaded from a truck was supposed to be located from the information on the move tag. This would have an extremely inefficient and costly operation for a move of this magnitude.

Packing and Unpacking Administrative Equipment - The company selected for moving SWRL's furniture and equipment to the new location was required to provide a set of procedures for the staff to follow in packing and unpacking. Examples of the instructions in the SWRL move included the following.

- All desks were to be moved intact except for:
    a) Pencils, pens, paper clips, etc. which were to be removed from middle drawers of desks, sealed in an envelope and replaced in a desk drawer.
    b) Desk pads were to be left on top of desks.
- Typewriters were to be unbolted and left on top of desk. Typewriters were moved in special containers provided by the movers.
- Stationery cabinets were to be emptied.
- Filing cabinets were to be emptied and the contents placed in desk drawers and the trays left on top of the desks.
- Wastebaskets were packed with ashtrays and any other small fragile items.

Special Equipment - Planning and conducting the move of special equipment was given the particular attention of a designated staff member because of the sensitive nature and high theft attraction of many items. A survey was taken early in the planning process to identify those items of equipment that would require special arrangements for their relocation to the new facility. The unique features of electronic data processing equipment, optical character recognition equipment, etc., required that separate moving companies specializing in the transportation of this type of equipment be utilized. For many of the items that were leased, the lease agreement stipulated that the equipment be transported under the lessor's direction and control. In many instances, specially constructed moving vans were required in transporting the special equipment to the new location.

Post-Move Inventory - A post-move inventory was taken immediately following the placement of equipment items in their new locations. The equipment ledger was then updated to show all newly purchased equipment and to identify any equipment which had been lost or damaged during the move. The post-move inventory proved to be a difficult and time consuming task because "punch-list" items were still being completed by the construction contractor resulting in many items being placed in locations other than the ones planned while still in cartons. Moreover, the institution was very vulnerable to the theft of equipment because of the necessity for the presence in the building of non-SWRL employees engaged in completing these "punch list" items. This made it necessary to utilize extremely strict control of foot traffic in and out of the facility. It also made it even more important to account for institution equipment as quickly as possible and place it in its proper location.

## STAFF RELOCATION

The relocation of SWRL to another community some distance away from its former locations created a need to provide financial and other assistance to those eligible staff members who wished to remain with the institution but would be required to move closer to the new location. SWRL's Personnel Office was assigned responsibility for assisting employees in the move of their residences. The success of these efforts is illustrated by the fact that every member of the SWRL professional staff transferred to the new location. Of the many services that were provided by Personnel, most fell into the following general classifications:

1) gathering and distributing information on the availability of housing in the new area;
2) obtaining information on and coordinating commuting and carpool arrangements; and
3) coordinating the move of personal household goods.

Housing. A questionnaire was utilized to identify the type of information concerning housing specifically desired by the SWRL staff in the following areas (Attachment 56).

- type of housing desired--purchase or rent
- size
- location--beach or inland
- municipality desired
- availability of schools

Once the information was gathered and compiled, the Personnel Office contacted the local Chambers of Commerce and Realty Associations for specific assistance. Information was distributed to interested staff members. The benefits of providing these services for the organization's staff are self-evident. Rather than 180 individual staff members spending their time gathering information in a haphazard fashion, one SWRL staff member performed the service in an organized and efficient manner.

Commuting. Many SWRL staff members desired to continue their employment with the institution after the move but did not wish to move their residences. Instead they were interested in commuting to the new location in car pools, public transportation and charter bus. The Personnel Office took the necessary action to establish car pools and contacted other large employers located near the new facility to make arrangements for SWRL employees to ride on their chartered buses. Schedules of public transit companies were also distributed.

Financial Assistance. SWRL decided to provide financial assistance for moving household goods to exempt staff members who were required to move from their present residences in order to continue their SWRL employment. Guidelines were developed which clearly set forth eligibility requirements and the procedures for obtaining financial assistance (Attachment 57).

## Working Paper 9

## SUMMARY OF PLANNING AND ACTIVITIES FOR BUILDING DEDICATION CEREMONIES, JUNE 2, 1972 (TN 4-72-08)

William F. Coulton

Dedication ceremonies officially opening the new facilities of Southwest Regional Laboratory (SWRL) at Los Alamitos, California, were held June 2, 1972. Nearly 200 officials of government, education, business, and industry attended the event that was highlighted by tours of the facility and an address by Robert H. Finch, Counsellor to the President. This paper recapitulates the planning and implementation of the dedication ceremonies.

## PLANNING

Preliminary discussions regarding ceremonies to open the new Los Alamitos facility began during Spring, 1971. In June, groundbreaking at the site occurred and occupancy of the building was scheduled for July, 1972. A memorandum, "SWRL Open House Activities: Preliminary Considerations and Notes for Discussion," was submitted to the Directorate in November, 1971. The memorandum covered various options and details for holding special ceremonies and events.

The Directorate selected general parameters upon which further planning documents could be drawn. In January, 1972, a second planning paper, "SWRL Open House Activities," was submitted for review. Construction of the new facility was proceeding so rapidly that Laboratory management agreed opening ceremonies could be held as early as June. On January 17, 1972 Robert H. Finch, Counsellor to the President, informed William H. Hein, Jr., Director for Business and Operations, that he would accept SWRL's invitation to speak at the ceremonies. June 2, 1972 was selected as SWRL Building Dedication Day.

During February, the SWRL Advisory Council and Board of Directors reviewed the tentative plans. Subsequent discussion among the Directors led to completion and approval of planning February 15, 1972. These plans included a special breakfast for approximately forty persons closely connected with the development of the new facility; a formal ceremony for approximately 200 invitees to be held in the main conference room; a luncheon buffet for all invitees; and guided tours through the facility. On February 18, a Dedication Ceremony Event Schedule was approved by the Directorate and planning was concluded.

## PROCEDURES

From February through June, 1972, tasks were carried out according to the Dedication Ceremony Event Schedule. A summary of the tasks is presented below in alphabetical order. Additional documentation beyond the topical discussion and appended information is available from the author.

### Agenda

The Agenda below was approved in February, 1972.

| | |
|---|---|
| 8:30 A.M. | SPECIAL BREAKFAST<br>Edgewater Hyatt House |
| 10:30 A.M. | DEDICATION CEREMONY<br>Conference Room |
| | Welcome and Introductions<br>Richard E. Schutz<br>Executive Director, SWRL |
| | Remarks<br>Norman Sharber, Chairman<br>SWRL Advisory Council |
| | Jack P. Crowther, Chairman<br>SWRL Board of Directors |
| | Address<br>The Honorable Robert H. Finch<br>Counsellor to the President |
| 12:00 NOON | BUFFET LUNCHEON<br>Simulation Laboratory |
| 1:00 P.M. | CONDUCTED TOURS OF FACILITY<br>Conference Room |

### Audiovisual Presentation

A slide/tape entitled "SWRL Overview," depicting the organization, program, and facility of SWRL was created for presentation during the afternoon session. The narrative was written concurrently with the tour narrative between March and May. A final version of the presentation included 49 visuals and was ready for review May 26, 1972. The length of the slide/tape is 15 minutes. A copy of the narrative text is available from the author; the complete production is available through Audiovisual Services.

### Breakfast

The criteria used to select a restaurant for the breakfast included:

- proximity to the Laboratory
- availability of motel accommodation within walking distance
- general reputation for quality of food and service
- reasonable cost

Restaurants contacted included Sheraton-Beach Inn, Huntington Beach; Edgewater Hyatt House, Long Beach; Holiday Inn, Long Beach; Rochelle's, Long Beach. The Edgewater Hyatt House was selected in March. Subsequent discussions during April and May pertained to attendance guarantee and menu.

### Buffet Luncheon

The Simulation Laboratory was selected as the best location within the building to hold the lunch activity. Decisions regarding hot or cold menu, buffet or seated luncheon, etc., were made after discussing the possibilities with knowledgeable persons. Catering firms were recommended for contact. The Casserole Catering, Ivy House, Rochelle's, Sorenson Catering, Swally's Restaurant, and Edgewater Hyatt House provided information and suggestions. By March, each caterer was requested to submit a price for all arrangements including chairs, tables, decorations, food, serving equipment, and personnel to provide a cold luncheon buffet for 250 persons. Casserole Catering, Swally's and Ivy House submitted bids. Based upon comparative price information, references contacted, presentations, and an inspection of caterer premises, Ivy House received the contract. Letters informing the other firms of this decision were sent.

### Decorations

Decorations were to be limited to flowers sent voluntarily by supportive organizations and persons; SWRL colors of white, yellow, and black with logo would be used where possible in signs, name badges, etc.

### Displays

Ample space in the Reception Area as well as the provision for permanent, moveable display fixtures permitted consideration of several types of displays. Building specifications included four large panels containing sixteen display surfaces; decorative cubes upon which materials could be placed were also part of the exhibit space plan. Large wall display boards located at each end of the fourteen work areas (open bays next to windows) provided visual surfaces for consideration. Three portable displays consisting of two two-panel and one three-panel units were constructed for use during and after the dedication event. Finally, numerous smaller bulletin boards and portable cork boards were available for display use.

Procedures for creating displays and writing the tour narrative were carried out concurrently. As tour points were identified and a narrative outline was produced, display requirements became apparent. The 13 focal points of the tour would require visual as well as oral explication. It would be useful, for example, to have a display of research documentation to assist the Presenter describing the role of the Product Design Division. Concomitant selections of products, materials, charts, and documents were made for displays in the Reception Area and elsewhere. Such items as the Ginn BRP, LCS, photographs of facility construction, SWRL reporting documentation, published technical volumes, and photographs of children using SWRL materials were included.

Between March and May, nearly 100 illustrations proposing material-content-design combinations were produced before the most appropriate ones were selected. Displays and their locations are depicted in Table 1 on page 5. Photographs as well as original illustrations and other documentation are available from the author.

## Emergency Procedures

Laboratory management established emergency procedures prior to occupancy of the facility on May 1, 1972. The Walworth Security Service had been employed from groundbreaking through occupancy. Contact with Orange County and Los Alamitos Fire and Police Departments assured immediate assistance. Los Alamitos Naval Air Station officials indicated they would assist in an emergency. Fire inspections and evacuation procedures were accomplished in May. Arrangements were made with Los Alamitos City Hospital for staff members or guests requiring emergency treatment.

Dedication Day procedures involved instructing the professional security personnel as well as SWRL staff members located within and outside the building about ways to assist and/or handle invited and uninvited guests. Discretion and tact were emphasized. Unless a person were obviously not invited and intended to create a disturbance, for example, security and staff were to treat the person with the highest respect. Where there was some doubt about the intentions of a person, he was to be courteously escorted directly to the Registration Desk in the Reception Area where the person's identity would be ascertained by normal registration processes. (See Registration, p. 17)

## Table 1

## Displays

| Location | Description |
|---|---|
| Reception Area | • Photographs of Construction Phases<br>• Ginn Kindergarten Program<br>• LCS<br>• SWRL Documentation Examples<br>• Published compendia |
| Library | Microfiche Print-out |
| Design Division (Portable Panels) | Product Design documentation including TN, TM, PP, TR papers |
| Product Development (Portable Panels and wall surface) | • Instructional Product Development Chart<br>• Projected completion dates for products, curricula, and systems by processing stages<br>• Printed summary describing BRP development including dates, tryouts, and other information |
| Product Integration (Portable Panels) | • User Support Systems Information<br>• Training Systems Information<br>• IMS illustrated by sketch and text |
| Learning Laboratories | Teletype terminal and other hardware |
| Simulation Laboratory | Removable wall panels showing chalkboard and vinyl surfaces |
| DRS | Photographic collage of school children using SWRL materials |
| Film Editing | Bulletin Board showing tasks performed; film in editing machine |
| Graphics Studio | Storyboards, Bulletin Board showing evolution of a graphic from concept to publication |
| Audiovisual Studio | Floor panel removed to show raised floor; television cameras and other equipment positioned in the audio and visual areas |

Table 1--Continued

| Location | Description |
|---|---|
| Print Shop | Board explaining duplicating process, types of jobs, etc. Actual demonstrations of copymakers, shrinkwrapper, stitcher |
| Instrumentation | One-of-a-kind instruments such as the pitch measurement device and multiple tape high-speed duplicator, other machines, equipment |
| Mag Card Room | Print-out explaining magcard capabilities |
| Computer Center | Print-outs explaining operations, IMS, and equipment |

In cases where the person was uninvited, but substituting for an invited guest, the same procedure would be followed as above, but with the additional step of getting authority from a Director or DRS MPS to register the person. Two-way radio contact between the parking area and Reception Area would alert officials inside the building of any actual or potential disturbance. Except for doors used for the tour, all other doors normally closed and locked would remain so during the dedication event.

Fire procedures included alerting all staff members connected with the dedication program about fire exits, evacuating the building, and contacting the Message Center for assistance. The Message Center would have complete instructions about calling fire departments and alerting Laboratory officials.

Medical procedures included instructing tour guides, presenters, and persons located throughout the facility to inform the Message Center of the need for a doctor, ambulance, car and driver, or other assistance. Directions in how to drive from the facility to the hospital were available in writing. No effort would be made to have a qualified person on hand or to ascertain the presence of physicians at the ceremonies. Normal first aid supplies would be available through the Message Center.

## Event Minus One Checklist

Concomitant tasks requiring diverse efforts of many staff members necessitated maintaining calendar, alphabetical, and other files in addition to the task schedules and event sublists. Of inestimable value throughout planning and implementation, however, is the Event Minus One Checklist, a tickler of essential details. All of those smallest details that would not otherwise get done unless written down when thought about, were entered and crossed off the Event Minus One Checklist. These items were constantly reviewed and eliminated whenever possible. On the day before the event, the Checklist was checked many times with the intention of completing or adding remaining tasks. Several of the staff members involved in carrying out tasks reviewed the Checklist on June 1st and everyone attempted to complete as many of the tasks as possible. Before leaving that afternoon, selected staff members again reviewed the list and considered additions. The Checklist reflects the kinds of tasks that required checking off the list that evening and before 9:00 a.m. the next day. Copies of the Checklist were distributed to appropriate staff members; each crossed off those tasks he completed. The result was that several persons checked and rechecked to insure and verify that every responsibility was accomplished.

## Guides

Developing a tour for attendees included a consideration of how to move individuals or groups through the entire facility. If left to their own devices, attendees would probably visit some parts of the building without seeing other parts. If presentations were held at various points in the facility, it would be difficult to know when to begin or end without some formal arrangement. Since it was desirable for attendees to see the entire facility and to receive presentations, various guidance systems were considered. Alternatives suggested included the use of signs, arrows, color-coded maps and floor plans, audiotape recorders, and other similar arrangements. Most of these alternatives did not, however, overcome the difficulty of controlling the number of persons congregating in one location or the amount of time spent there. The best alternative, it appeared, would be to have a very structured, synchronized, guided tour in which staff members would lead groups of persons through the building to various presentation points. If the number of groups equalled the number of presentation points, and if every group moved according to prearranged schedule, then absolute control was assured.

Following the approval of displays, tour narrative content, tour route, and an estimate of the number of attendees, it was decided that 13 guides would be used. Each would take a group of between 10 and 15 persons along the tour route, explaining certain areas of interest, answering questions, and introducing the Presenters at each focal point. The Guides would share with the Presenters the responsibility for moving the groups on time from one point to another; each would also be given emergency fire and medical assistance instructions.

Members of the support staff were selected in May as Guides. Each was given a copy of the "Tour Presentation to Assist Guides, Presenters," which had been expanded to include guide commentary, introductions, procedures, and sample schedules. Guides met three times during the final week before Dedication. The first time, a management secretary used the prepared commentary while leading the Guides along the tour route; the Guides were then instructed to practice in pairs until they were confident and knowledgeable. The other two meetings concerned using the schedules, synchronizing watches, moving to first and final tour points, and closing the tour.

## Hospitality

Although numerous staff members were assigned to assist attendees outside and within the facility, a few were charged directly with the responsibility of making the guests feel welcome and accommodated. Four DRS professional staff members were assigned to greet invitees at the door, to assist them to the registration table or message center, to introduce them to other guests, and to direct them to the coffee table, restrooms, conference room, or other areas. Uninvited persons exhibiting conduct unseemly to the occasion would also be identified by these staff members and a member of the security guard or directorate would be so informed. (See Emergency Procedures, p. 4) Three staff members were assigned to serve guests coffee and doughnuts from 9:00 until 10:00 a.m.

One person was designated to handle all incoming news media representatives. His responsibility included assisting them in registering, arranging for equipment placement and providing them with press kits. Acquiring additional information, taped speeches, photographs, interviews, were also to be coordinated by this individual.

## Information Packet and Handouts

As part of the information program, a packet of materials and handouts was created for distribution to the attendees. The printed publications included items pertaining to facility, organization, institution, program, and products. It was intended that these publications would be brief, aimed at a general audience, contain photographs when necessary, and provide insight into SWRL's past achievements as well as present activities. A folder in which to arrange these materials was also designed.

The information packets were placed on the Conference Room chairs by DRS support staff members between the morning and afternoon sessions. News representatives received the packet upon arrival. Dr. Robert O'Hare briefly discussed the packets during the afternoon and indicated that attendees would be acquiring additional information items during the tour. Two staff members were assigned to the Reception Area from 11:15 until 4:15 to distribute information packets to persons not attending afternoon activities and to attendees wanting additional packets. Following are annotations of packet contents. Copies of these materials are available at DRS.

- "SWRL Program Documentation" An annotated bibliography including PP and TR documents produced during the past six years.
- "SWRL Benchmarks" A thumbnail review of significant dates and events involving the organization and development of SWRL.
- "Evolution of the SWRL Facility" A sketch of the major planning and construction events related to the new facility in descriptor and photographic form.
- "The SWRL Kindergarten Program" A description of the recently published beginning reading program in the form of a brief.

- "Systems for Comprehensive Educational Programs" An overview brief in which the SWRL program and related information is explained in layman's terms.

## Invitations

Commercial catalogs of imprinted invitations as well as discussions with persons knowledgeable about such matters revealed several possible styles of invitation, RSVP, and Special Breakfast return cards. A style that was easily adapted to include a sketch of the SWRL facility and use of the SWRL logo was selected. Using donated funds, invitations and programs were commercially printed. Invitations were hand-addressed and mailed to 383 invitees.

## Invitees

During April and early May, 383 persons received formal invitations to attend dedication events. Invitees were selected by Laboratory Management on the basis of the person or organization having worked closely with SWRL in matters of organization, institution, program, or facility during the past. Although many more persons normally would have been included, seating in the Conference Room limited prospective attendees to approximately 230. A complete list of persons invited is available in the Division of Resource Services. Following is a table depicting the group representation and events to which individuals were invited. In addition to the invitees below, 25 news media representatives were selected and sent a news memorandum about the event.

## Letters and Enclosures

Several types of letters and enclosures were required to furnish invitees with information about the event. During April, 1972, a letter accompanied formal invitations to U.S. Congressmen and selected federal officials. Another letter in eight variations with maps, agendas and other enclosures was sent to furnish affirmative respondents additional information. This was sent out regularly during April and May. For those officials designating replacements who would represent them at the ceremony, a letter was prepared with enclosures to inform the delegates.

On May 18, 1972, those invitees not responding at all were sent a letter reminding them of the event and encouraging them to attend; appropriate enclosures were included. All invitees responding positively between May 18 and May 28, 1972 were sent letters of acknowledgement with enclosures.

## Table 2

## Invitees

| Group | Dedication | Dedication and Special Breakfast |
|---|---|---|
| SWRL | | |
| Advisory Council | 61 | 5 |
| Board of Directors and Attorney | 19 | 19 |
| Directorate and Staff | 27 | 5 |
| Facility Architects, Construction Management, Engineers | 10 | 10 |
| United States Congress | 46 | - |
| Congressional Staff Members | 6 | - |
| School Officials | 145 | - |
| Federal Officials | 22 | 22 |
| Governors | 3 | - |
| State Legislators | 3 | - |
| Local City Government Officials | 4 | - |
| Professional Colleagues | 21 | 1 |
| Publishers | 9 | - |
| Signatory Representatives | 7 | 7 |
| TOTAL | 383 | 69 |

Following the event, letters were sent to speakers and selected attendees thanking them for their support of SWRL; these letters were accompanied by photographs of the individuals when possible. A matrix depicting the variety of letters and enclosures sent between April and July, 1972 is found on page 13.

## Lodging

Several motels and hotels in the vicinity of the Laboratory were contacted during March regarding accommodations for out-of-town guests. The availability of a restaurant nearby for the special breakfast was a consideration in selecting lodgings. Other criteria included reasonable price ranges, access to airports and tourist attractions, guest services, and clean accommodations. The Newporter Inn, Sheraton-Beach Inn, Holiday Inn, and Edgewater Hyatt House were contacted. The Edgewater Hyatt House was selected as the preferred motel due to its proximity to the Laboratory, its ability to handle up to 100 room reservations for June 2, and its accommodations for holding the special breakfast. Edgewater Hyatt House provided imprinted reservation cards, maps, and other information which were sent to all out-of-town guests. Personnel at the Edgewater Hyatt House furnished updated lists of SWRL guists staying there so they could receive messages.

## Message Center

Activity and information coordination was maintained during June 1 and 2 by a Message Center. This was a central point where anyone needing information or assistance could obtain it. Adjacent to Registration and the reception desk in the Reception Area, the Center was operated by two members of the support staff. Materials for operating the Center included an alphabetical list of invitees, directories of hotels and newspapers, news media and press kit information, maps, airline schedules, forms for entering transportation and airline reservation requests, fill-in news releases, envelopes, first aid supplies, written procedures for emergencies, and a directory of SWRL invitees staying at the Edgewater Hyatt House. Equipment included telephones and a two-way radio connecting the Center with parking, security, and building maintenance personnel.

The Center was able to provide directions to incoming motorists; make lodging, transportation, and airline arrangements; deliver messages to attendees and SWRL staff; and assist guests in filling out news releases and mailing them to their local newspapers.

## Table 3

## Letter and Enclosure Matrix

| | Invitation by Personal Letter | Letter #1 Breakfast In-Town Expenses | Letter #2 Breakfast Out-of-Town Expenses | Letter #3, In-Town, No Expenses | Letter #4 Out-of-Town Expenses | Letter #5 Breakfast, In-Town, No Expenses | Letter #6 Breakfast Out-of-Town No Expenses | Letter #7, In-Town, Expenses | Letter #8 Out-of-Town No Expenses | Letter #9, Delegate | Letter #10 Acknowledgement After May 18 | Letter #11 Reminder, May 18 | Letter #12 "Thank You" June, 1972 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enclosures* | | HM<br>LM<br>BA | HM<br>LM<br>RC BA | LM<br>A | HM<br>LM<br>RC A | HM<br>LM<br>BA | HM<br>LM<br>RC BA | LM<br>A | HM<br>LM<br>RC A | LM<br>A | LM<br>A | LM<br>A | P |
| **GROUP** | | | | | | | | | | | | | |
| Congressmen | X | | | X | | | | | X | As Required | As Required | As Required | X |
| Federal Officials | X | | | | | X | X | | | | | | X |
| SWRL Board of Directors and Advisory Council Officers | | X | X | | | | | | | | | | X |
| SWRL Advisory Council Members | | | | | X | | | X | | | | | X |
| Architects, Constr. Mgr., Engineers | | | | | | X | X | | | | | | X |
| Other Guests | | | | X | | | | | X | | | | X |

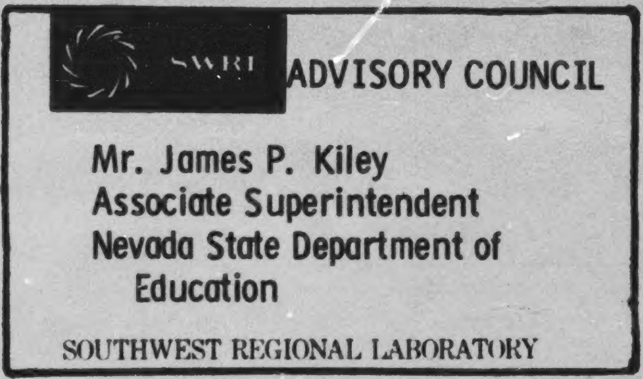
*Enclosure Key
HM - Hotel Map
LM - Laboratory Map
BA - Breakfast Agenda (8:30 a.m.)
RC - (Room) Registration Card
A - Agenda (10:30 a.m.)
P - Photographs

## Name Badges and Holders

Commercially available badges and holders were collected during March, 1972. Cloth, paper, plastic, self-adhesive, and a variety of printed and sewn badges of different shapes and sizes were examined. Few of these were appropriate. It was decided in April that DRS staff members should design a badge for use in a plastic holder.

Two types of badge holders were selected. These were the slip-on breastpocket and pin-on type. By using both kinds, attendees would be able to choose a holder best suited to his clothing. The holder size dictated the amount of space that could be used in designing a badge.

Badge design considerations included print size and quantity; paper and print color; use of logo, etc. Below is a copy of the printed badge designed for the dedication.



SWRL ADVISORY COUNCIL

Mr. James P. Kiley
Associate Superintendent
Nevada State Department of
Education

SOUTHWEST REGIONAL LABORATORY

Seven formats of information were used to identify persons and groups such as the SWRL Board of Directors, SWRL Advisory Council, News Media, etc.

All fill-in information such as the name, title and organization of attendees was typed using an IBM Executive machine with a carbon ribbon and primary print. Badges were printed and filled in during the final week before dedication. All invitees who had not replied negatively would have badges ready for them. Badges were arranged in alphabetical order at the Registration table during the afternoon of June 1; both kinds of holders were also on hand.

## News Media

Preparations for news coverage of the event were accomplished with the advice of public relations representatives and the assistance of an educational publicist and officials in Washington, DC. Since the number of invitees was restricted by the size of the Conference Room, news media representatives were also limited. Twenty-four media representatives were contacted by news memorandum a week in advance of dedication.

A Press Kit was prepared. The contents included the information packet materials (See Information Packet and Handouts, p. 9) provided other attendees and a copy of Mr. Finch's speech. The "Tour Narrative" was also available for media use, but not placed in the folder.

The educational publicist who assisted in selecting media invitees was on hand to greet and assist the representatives at dedication. His responsibilities were to arrange interviews, introduce newsmen to guests, and see that the representatives were provided with press kits. If any newsman wanted a personal tour of the facility, photographs, tapes, or other materials, he was to arrange details with members of the Division of Resource Services.

For those newsmen who preferred to sit at a table and write notes during the dedication, a pressroom was prepared. The Film Preview Room behind the Conference Room was outfitted with a television monitor, table, chairs, writing materials, and ashtrays. Telephones adjacent to the Pressroom also were available for media representatives.

In case Mr. Finch or other dignitaries desired to hold a press conference, it was planned for immediately after dedication ceremonies in the Conference Room. Other areas selected for interviews included DRS Conference Room 158, the open bay in front of the Product Development Division Display upstairs, and in front of the product displays in the Reception Area; the latter two locations were selected to afford television interviewers visual discussion points.

For reporters who might telephone or stop momentarily at the Laboratory, the Message Center was provided a list of the kinds of information and media available to newsmen following the event. These included audiotapes, videotapes, photographs, tour narrative, speeches, a wrap-up news release, and program and product information briefs. Calls by reporters also were to be referred to Publication Services staff who would arrange follow-up interviews or send out appropriate information when requested. All incoming calls from reporters were to be logged for future reference. A copy of the memorandum, the news releases prepared for guests and event wrap-up are contained in Appendix A.

## Presenters

Following the completion of the tour narrative, Presenters were selected for twelve of the thirteen presentation points along the tour route. These members of the professional staff would explain the function of a particular area for approximately four minutes. Attendees could then ask questions for approximately three minutes before moving on to the next point. The thirteenth tour point would be described by the Guides.

Each Presenter was given a copy of "Tour Presentation to Assist Guides, Presenters" May 15, 1972. During that week, the Presenters walked along the tour route, each person making his presentation at the appropriate point. Additional practice was gained during SWRL Family Day, May 20, 1972, when Presenters made informal presentations to their families and friends. Displays were set up for Family Day and this was the first opportunity anyone had to relate the oral with the visual presentations. Presenters were able to use the displays to advantage, and numerous suggestions for revising the tour narrative were made following Family Day.

The Presenters met once during the final week before Dedication to receive instructions about schedules, watch synchronization, assisting Guides, and permitting tour groups to move on time.

## Program

A printed program to be given to all attendees was designed in conjunction with the formal invitations. Most of the design elements selected for the invitation such as use of logo, sketch of the new facility, paper stock, printing style, and tone of the publication would be incorporated in the program as well. Essential information such as time, place, names of Laboratory and other officials, agenda, locator maps of the facility and recognition of organizations and persons contributing to the success of the building program were included.

Procedures for creating the program involved discussions with persons in public relations, commercial printing and commercial design. Numerous examples of programs developed for use by industrial and governmental organizations were examined during late February, 1972. By March the text and layout had undergone several revisions and were ready for reproduction.

Approximately 300 copies of the program were produced in May, using donated funds. The programs would be placed at Registration during the afternoon of June 1 for distribution to each registrant.

## Recording

After deciding on the kinds of data that should be obtained during dedication for subsequent internal and external communication use, collection methods were selected. Materials and equipment used in the process of collecting oral, written and non-verbal event data follow:

- Visitor's Book (Registration)
- Fill-in News Release Form and Log (Message Center)
- Transportation/Lodging Assistance Forms (Message Center)
- News Media Information Request Log (Message Center)
- Videotape of Dedication Ceremony (A/V Department)

- Audiotape of Dedication Ceremony (A/V Department)
- Speech Transcriptions (Publication Services)
- 16mm Film of selected activities throughout day (A/V Department)
- 35mm Color Slides of selected activities throughout day (A/V Department)
- 35mm Black and White Photographs of selected activities A/V Department)
- Attendee/Staff Feedback About Event (Publication Services)
- News Clipping File of all coverage given event (Publication Services)

## Registration

Registration of attendees was intended to be a very brief and pleasant experience. To this end, advance preparations included typing name badges for everyone on the invitee list except those who declined; reproducing the guest sign-in book in three sections; reproducing the guest list with names, titles, organizations, and addresses in alphabetical order for easy reference; and having official programs and two types of name badge holders ready several days ahead.

In-coming attendees would be able to form three queues according to their last name: A-J, K-Q, R-Z. Each attendee would sign the guest book, select a badge holder, tell the staff member handling that queue his name (badges would be spread across the table in alphabetical order), and be given his badge and a printed program. In cases where there was no name badge already typed, the registrar would identify the person by using the alphabetical list of invitees and give the information to a typist who would prepare the badge. Selected DRS staff or a Director would be summoned to authorize a person to register when his name was not on the list of invitees.

Registration equipment would include a primary-style IBM typewriter, two 6' x 3' tables, appropriate signs, standard writing and typing list of invitees, and emergency information.

## Reporting

To provide for internal and external accounting of Dedication activities, reporting requirements were anticipated and appropriate means of collecting data were applied. The planning and implementation memorabilia, forms, news releases, speeches, multimedia records, summaries, photographs and files would comprise the artifacts. Formal reporting would include furnishing combinations of artifact materials to Laboratory-connected persons and selected audiences outside the Laboratory. Informal reporting would include furnishing informational shards that normally result from collection efforts to persons within and outside the Laboratory when feasible. Below are lists of reporting instruments anticipated:

- Topical files of dedication event planning and implementation for internal use
- Dedication Day Summary publication for external distribution
- Technical Note describing planning and implementation for internal use
- Photographic display for use in Reception Area
- 16mm film production covering major dedication events for potential internal/external use
- News release summarizing dedication events for external distribution
- Speeches and other information as requested by news media
- Letters thanking speakers and attendees for their participation
- Videotape production for internal use
- Photographs taken during the event sent to those persons appearing in same
- Slide-tape production on evolution of new facility based on the "evolution" publication and other information derived from dedication data
- Up-dated list of Laboratory-related officials with correct titles, organizations, and addresses
- Exploitation of Dedication Day procedures for Principal's Day held June 19, 1972 and subsequent tours for visitors and meeting conferees

## Signs and Placecards

Sign and placecard requirements were amplified because the regular, permanent signs identifying Laboratory rooms would not be installed in time for dedication. Therefore, temporary signs were prepared, using commercial vinyl letters on gold-colored artboard. These were fastened to walls and doors with double-backed tape. Following is a complete list of room, directional, and miscellaneous indoor and outdoor signs prepared by the Graphics Studio during May for the event.

Room and Area Identification Signs

LIBRARY
PRODUCT DESIGN

PRODUCT DEVELOPMENT
FILM EDITING
PRODUCT INTEGRATION
LEARNING LABORATORY
SIMULATION LABORATORY
DIVISION OF RESOURCE SERVICES
PRINT SHOP
AUDIOVISUAL STUDIO
SHIPPING AND RECEIVING
INSTRUMENTATION
SNACK SHOP
COMPUTER CENTER
MAG CARD ROOM
BUSINESS MANAGEMENT
MANAGEMENT
CONFERENCE ROOM

Directional Signs

NO PARKING (for front of building)
AUTHORIZED PERSONNEL ONLY (for use in corridors)
THIS ROW RESERVED (for first two rows in Conference Room)
RESTROOMS →
← RESTROOMS
← RESTROOMS
BUFFET →
← BUFFET
← BUFFET
(Placed on Standards near Learning Labs)

Miscellaneous Signs

REGISTRATION (for Registration Table)
A - J
K - Q (for Registration queues)
R - Z
MESSAGE CENTER (for Message Center Table)
DIAGRAM OF LABORATORY (for Reception Desk)
SWRL LOGO/NAME (for Podium in Conference Room)

**Speeches**

Plans were made to have the major address presented by Counsellor Finch with additional remarks made by the SWRL Advisory Council Chairman and the Chairman of the Board of Directors. The Executive Director of the Laboratory would welcome the guests and introduce the speakers. Since the Advisory Council Chairman was unable to attend due to illness, the Vice Chairman of the Council would speak on behalf of the Council.

An advance copy of Mr. Finch's speech was obtained several days before the event. The SWRL officials also prepared brief outlines of their presentations. Although these speeches and remarks were available, it was anticipated that an audiotape of the actual ceremonies would be the best record of the speeches. Therefore, Mr. Finch's speech was duplicated and used only as part of the press kit given news media representatives upon arrival Dedication Day. All subsequent use of the presentations would be derived from an audiotape transcription.

## Staff Support

Dedication planning and implementation were mainly confined to SWRL management and DRS personnel, although everyone associated with the Laboratory would provide some support. Once the SWRL Advisory Council and Board of Directors approved the agenda and program, Publication Services CRC conducted a series of interviews with MPS and Directorate members regarding the content of the tour, displays, and other details. Subsequent activities sporadically involved Print Shop, Graphics, and Audiovisual personnel from March through June 2, 1972 in completing detailed arrangements.

Members of the professional staff and support personnel associated with the proposed guided tour and related activities would receive minimal amounts of instruction and were not required to devote more than a few hours in preparation for the event. Management Support staff having responsibilities for the equipment, facility, maintenance, and vehicles of the Laboratory would contribute heavily during the final days as every effort was made to remove all undesirable traces of recent construction, painting, and moving.

## Tour

An outline of the proposed tour was completed in March, 1972. Fifteen areas of the facility were considered as presentation points. Between March and May, numerous drafts of the tour narrative were completed, using Laboratory program documentation, facility, and equipment specifications, and interviews with Directorate and MPS. Immediately after moving into the facility April 28, 1972, the tour plans were reviewed in terms of the visual impact of the facility and equipment, the amount of time required to move along the proposed route, and the places where displays and presentations could occur. By May 20, SWRL Family Day, the Presenter's portion of the tour narrative was modified and ready for tryout. On the basis of this tryout, various Presenters suggested changes in the narrative that would relate the content more closely to the illustrative materials displayed at the tour points. By May 26, the Guide, introductory and supplementary information in the narrative was complete. Tryouts revealed the tour was too long; two stations were eliminated so that the length of the tour was reduced to approximately one and one-half hours. A final version of the tour was developed including introductory remarks, names of participating staff members, and location maps for use by staff.

Conducted tours would involve conferees leaving the Conference Room in groups of 5-15 people with a Guide. Each Guide would take her group to a pre-designated area of the building where a Presenter would explain what that particular area contributed to Lab operations. Every eight minutes, the tour Guide would move to the next point on the itinerary. Guides and Presenters used synchronized watches and a starting schedule to insure that no two groups would meet together at the same tour point.

## Transportation

Some of the guests arriving and departing Santa Ana (Orange County), Long Beach, and Los Angeles International Airports and those staying at the Edgewater Hyatt House would require transportation assistance. Since the five Laboratory stationwagons would be used to carry many of the special breakfast guests to and from the Edgewater Hyatt House, commercial vehicles and drivers were hired for use during June 2, 1972. All drivers operated under the direct supervision of Management Support personnel. Arrangements for picking up and delivering guests were made via two-way radio between the Message Center and a transportation supervisor. Drivers were instructed to telephone the supervisor upon arriving at a pickup point to find out whether additional persons were waiting there. This service was operated from 6:30 a.m. until 7:30 p.m. June 2, 1972.

Additional transportation services included making commercial airline reservations.

## EVENT SUMMARY

Dedication Day activities were carried out on schedule and according to the procedures previously described. Twenty-nine officials attended the special breakfast at the Edgewater Hyatt House; 164 persons registered to attend the ceremonies at the Laboratory.

At approximately 9:45 a.m., Robert Finch arrived and was given a personal tour of the facility by Richard Schutz and Jack Crowther, Executive Director and Chairman of the Board respectively. Accompanying the group was Harry Silberman, Director of the NIE Planning Unit, USOE.

Ceremonies officially dedicating the new facility commenced at 10:30 a.m. More than 200 persons, including many SWRL staff members, heard presentations by Drs. Schutz and Crowther, and Mrs. LaVerne Parks, Vice Chairman of the SWRL Advisory Council. Counsellor Finch then gave the major address.

Following the ceremony was a press conference at which two newspaper reporters interviewed Mr. Finch and Dr. Schutz. Discussion centered upon national and local educational issues as well as points of information related directly to SWRL and the new facility. Results of this interview and other contacts made by radio and newspaper representatives would include news coverage in the Anaheim Bulletin, Orange County Evening News, Long Beach Press Telegram, Santa Ana Register, Education Daily, and mention of SWRL on Los Angeles' Channel 5 KTLA television station, radio station KGER, Long Beach, and in the Los Alamitos Journal.

The buffet luncheon was served in the Simulation Laboratory. Laboratory staff members were invited to participate. Extra food was sent to the Intercommunity Exceptional Children's Home, a resident school for the retarded. Officials at the Home, located in Long Beach, were most appreciative.

The afternoon was highlighted by presentations about the facility and program, followed by the guided tour. William H. Hein, Jr., Director of Business and Operations, opened the session by describing the evolution of the facility. The filmstrip explaining Laboratory organization, program, and accomplishments was shown. Robert W. O'Hare, Associate Director for Resource Services and Product Integration Divisions, then commented on the design and use of the facility.

Following these presentations was the one and one-half hour tour in which presentations were made at the Library, Product Design, Product Development, Product Integration, Learning Laboratories, Simulation Laboratory, Resource Services, Film Editing, Graphic Design Studio, Audiovisual Studio, Print Shop, Instrumentation, and Computer Center. Displays of products, materials, documents and charts indicated the scope of SWRL's present program as well as future plans. Of particular interest were the specialized areas where guests could see some of the latest equipment and materials used in developing product components for tryouts.

Throughout the day, attendees used the Message Center to arrange transportation and airline reservations. Drivers were available to pick up and deliver more than 25 guests needing assistance. Message Center staff processed 76 news release forms filled out by attendees for mailing to hometown newspapers.

Approximately 200 programs and 180 information packets were distributed to attendees during the day. In addition, Presenters at the Library and Computer Center distributed approximately 40 handouts to guests during the tours. Activities were concluded by 4:30 p.m. and all equipment and materials were secured.

On the following Monday, 24 news releases summarizing events were sent to national educational magazines and newsletters. Photographs taken during dedication were displayed on portable panels in the Reception Area; duplicate copies of selected photos were sent with a letter to all participants who were recognizable in the photographs.

Staff members were able to see the videotaped highlights of dedication day on monitors in the Simulation Laboratory on three occasions during the week of June 12. Motion picture film was developed and filed for future use.

A dedication summary publication containing photographs and descriptions of activities was prepared during July for distribution to attendees. This publication is intended to provide each person attending the event with a capsulized record of the occasion.

# Appendix

## News Media Information

- News Memo
- Information Available to News Media
- News Release

SWRL
SWRL EDUCATIONAL RESEARCH AND DEVELOPMENT
4665 LAMPSON AVENUE LOS ALAMITOS, CALIFORNIA 90720 TELEPHONE 598-7661 AREA CODE 213

May 8, 1972

Contact: Bill Coulton
Ext. 356

NEWS MEMO

Presidential Counsellor To Dedicate
New Educational Research Laboratory Facilities

Friday, June 2, 1972
10:30 a.m.
4665 Lampson Avenue
Los Alamitos, California

Robert Finch, counsellor to President Nixon and formerly head of the United States Department of Health, Education, and Welfare, will be the keynote speaker at dedication ceremonies for new facilities to house the Southwest Regional Laboratory for Educational Research and Development.

Commonly known as SWRL, the laboratory (which opened in 1966) has had to occupy several floors in buildings around the Los Angeles area. The most modern facilities for research and development in the field of education now will be under one roof.

Press activities available for June 2 include: (1) Press conference with Counsellor Finch, (2) Inverviews with top officials of the laboratory, (3) A tour of the facilities to photograph the very latest machines, equipment and techniques to be used to advance educational research and development.

Attached are a map showing location of laboratory and an agenda. Available to assist in covering this event will be Bill Coulton (213-598-7661) and Jack Gillean (213-687-4341).

# # #

May 8, 1972

## INFORMATION AVAILABLE TO NEWS MEDIA

- Wrap-up Story with Black and White Photos of Dignitaries
- Audiotape and Videotape Bits
- Summary of Dedication Events
- Excerpts or Text of Mr. Finch's Remarks
- Information Packet about SWRL including:
    - History of Laboratory
    - Story of the SWRL Facility
    - SWRL Program Description
    - SWRL Kindergarten Program Brief
- Copy of Dedication Day Program Agenda

SWRL
SWRL EDUCATIONAL RESEARCH AND DEVELOPMENT
4665 LAMPSON AVENUE LOS ALAMITOS, CALIFORNIA 90720 TELEPHONE 598-7661 AREA CODE 213

For further information:

William F. Coulton
Southwest Regional Laboratory
Division of Resource Services
4665 Lampson Avenue
Los Alamitos, CA 90720

Telephone: (213) 598-7661

**FOR IMMEDIATE RELEASE**

Also available:

- Glossy Prints
- Literature
- Videotape
- Audiotape
- Mr. Finch's Speech

# COUNSELLOR FINCH DEDICATES NEW SWRL FACILITY

Dedication ceremonies officially opening the new facilities of Southwest Regional Laboratory (SWRL) at Los Alamitos, California, were held June 2. More than 200 officials of government, education, business, and industry attended the event that was highlighted by tours of the facility and an address by Robert H. Finch, Counsellor to the President.

The Laboratory, which operates solely in the public interest with funds from the U.S. Office of Education, produces research-based instructional products for use in the Nation's schools. SWRL has been in operation nearly six years and has several reading and early learning products in use with children throughout the United States.

Finch, who was Secretary of the U.S. Department of Health, Education, and Welfare when the planning for the new facility was

(MORE)

begun, noted: "Not only is this SWRL structure the first to be completed under the Cooperative Research Act, it is the first off-campus facility ever constructed exclusively for educational research and development. Only a mechanism, an institution like this, can provide an important interface between the public and private sectors."

The new 88,800 square foot building, which houses the latest educational research and development equipment including computer, television, simulation, and learning laboratory facilities, is located on a 12 acre tract that was formerly part of the Los Alamitos Naval Air Station. Dr. Richard E. Schutz, Executive Director of SWRL, emphasized Counsellor Finch's role in obtaining the facility. "SWRL is indebted to Counsellor Finch for his initiative in taking personal action to release the Cooperative Research Act appropriations that built the facility we dedicate today. He also established the Facilities and Engineering Construction Agency within HEW that has been so helpful to us in achieving cost savings in connection with the construction," Schutz said.

Mrs. LaVerne Parks, Vice President of the 68-member SWRL Advisory Council that represents the interest of citizens in Nevada, California and Arizona, stated that the new building "will permit SWRL to increase the scope and sophistication of its R&D. I find the fact that the SWRL Kindergarten Program will be used by more than ten percent of the Nation's kindergarten youngsters next fall particularly gratifying."

(MORE)

Speaking as Chairman of the SWRL Board of Directors, Dr. Jack Crowther stated that SWRL has been important because of the quality program it provides youngsters in the classroom. "And I don't think," he noted, "that what SWRL is doing could be done by any other institution--not by a school district, not by a university, not by a business."

The Laboratory has a staff of 200 professional and support personnel including specialists in reading, linguistics, psychology, computer science, as well as in all areas of professional education. Artists, engineers, writers, editors, and telecommunication specialists are also among those working on the Laboratory's school program.

####################

## Working Paper 10

# OPERATIONS STUDIES - CUSTODIAL AND GROUNDS MAINTENANCE SERVICES FOR AN EDUCATIONAL R&D FACILITY (TN 1-75-01)

Robert L. Christensen and William H. Hein, Jr.

The physical appearance and condition of the facility and grounds of an educational research and development institution will have a direct effect on the productivity and efficiency of the institution's staff. The morale and motivation of personnel engaged in R&D will be understandably lower if their work environment is neglected and unkempt. On the other hand, clean and well-kept work surroundings will contribute toward higher staff productivity, lower turnover of staff and the institution's increased ability to recruit more able personnel. This document describes the analyses performed by SWRL Educational Research and Development in determining its requirements for these services and the relative advantages and disadvantages of providing the services through outside contractors or the institution's own employees.

## Institutional Characteristics

A consultant was retained to aid the staff in making the necessary analyses and determining the preferred method of performing the services. The first step, therefore, was for SWRL to identify for the consultant those institutional characteristics that would be controlling or at least influential in determining the general nature of the services to be performed and the preferred method of providing them. The institutional characteristics that were identified and the resulting general specifications for the services are as follows.

1. Because of its unique organizational mission and high visitor visability, the SWRL facility and grounds must be provided with a high level of cleanliness, sanitation, and appearance. This requires that the equipment and supplies used for this purpose be sufficiently effective to maintain the housekeeping standards that are developed. Moreover, the personnel providing the services must be reasonably skilled and experienced in their performance.
2. Because of SWRL's reliance on scarce public funds for program support, the housekeeping program must be efficient and economical. Each proposed expenditure is a subject for negotiation with Federal contracting officials.
3. Because of the constantly changing nature of the R&D activities conducted by SWRL, the housekeeping services must be reasonably flexible and adjustable to the varying service needs of the R&D staff.
4. Because its facility, equipment and grounds are public property, SWRL must be provided with a housekeeping system that avoids damage to materials, extends surface life, and protects equipment.
5. Because the quality and quantity of outcomes of SWRL activities can be lowered by disruption of R&D activities, the necessary housekeeping services should be provided by methods that minimize the possibility of interruptions in housekeeping services for any reason including labor disputes.

## Facility and Grounds Features

The second step was for the consultant to identify from the plans and specifications, those physical features of the facility and grounds that would necessitate specific types of services. The consultant concluded that the new SWRL facility included many features that facilitated maintenance efficiency. The majority of the floor space was to be carpeted, and the building air conditioned with large glass areas. The traffic patterns were well laid out. The walls and ceilings would be paneled and painted surfaces. The removal of litter and debris and the use of mechanical cleaning equipment could be accomplished with relative efficiency. As for the grounds, the salient features were that all lawn and planted areas could be watered using the sprinkler system with a minimum of hand watering. Use of mechanized equipment would reduce significantly the manhours necessary to maintain the grounds, walks and drives. And finally, the removal of litter and debris could be done efficiently.

## Specific Custodial Requirements

The third step was for SWRL, with the consultant's assistance, to select the specific services necessary for care of the facility and the frequency of their performance based on the above institutional characteristics and physical features of the facility. The results of this effort are set forth below.

### Daily Service (5 days)

Vacuum all traffic lanes, entry ways, and corridors.

Spot clean rugs and carpet.

Mop and buff all composition floors in lobbies, corridors, and lounges.

Remove black and scuff marks and stains from floors in the above areas.

Dust mop all composition floors.

Dust all flat surfaces such as desks, window ledges, office furniture, and equipment.

Empty and damp wipe wastebaskets, disposal cans and other receptacles.

Empty and wash ash trays.

Empty pencil sharpeners.

Remove all fingermarks, smudges, carbon stains, etc., from desk tops.

Clean drinking fountains.

Clean and service all sand runs.

Clean all metal work in elevators, entrances and hand rails.

Spot clean walls, woodwork, baseboards, glass partitions, glass doors, and entrances.

Sweep stairways as necessary.

Wash blackboards that are cleaned of written work and dust chalk trails.

Replace burned out lamps.

Restrooms

Scrub and sanitize floors.

Clean commodes, urinals, sinks, faucets, and metal fixtures.

Clean and sterilize both sides of toilet seats.

Wash all mirrors and spot clean partitions.

Wash and polish toilet tissue, paper towel and sanitary napkin containers.

Spot walls.

Fill soap, towel, toilet tissue, and toilet seat containers.

Weekly Service

Vacuum all rugs and carpet.

Wash tile walls in restrooms.

Dust low ledges, mouldings, door and window casings.

Clean picture glass and dust frames.

Clean telephones.

Monthly Service

Clean and polish all wood furniture.

High dust all areas, including air conditioning vents, fans, etc.

Vacuum all draperies, furniture, and cornices.

Dust wood paneling.

Clean, wax, and buff all composition and tile floor areas to maintain good appearance.

Yearly Service

Shampoo all carpeting.

Window Washing Service

The frequency of window cleaning should be four times a year for interior and exterior cleaning.

Recognition Of A Service Factor

In addition to the above services provision for a service factor of eight (8) hours per day should be made to perform the following services:

Set up chairs, tables, equipment, and audio visual materials.

Receipt, storage and hauling of equipment, materials, and supplies.

Opening, closing, and securing the building.

Replace burned out lamps.

Spot clean emergency spillage.

Emergency restroom service.

Inspect for and identify safety requirements.

Refer maintenance needs such as plumbing, carpentry, and painting to facilities manager.

Perform related duties as required.

## Specific Grounds Maintenance Requirements

Fourth, the specific services required to care for the grounds and the frequency of their performance was determined.

### Daily Service (5 days)

Sweep and hose lobby entrances and sidewalks.

Sweep parking lot, walks, and drives.

Pick up and dispose of litter on grounds, planted areas, parkways, and parking areas.

Water and weed lawns and planted areas.

Clean oil and grease spots in parking areas.

Adjust, oil, and clean power tools and equipment such as mowers, edgers, and sprayers.

Maintain, adjust, and repair sprinkler system.

### Weekly Service

Mow, trim, and edge lawn areas.

Clean up and remove all debris resulting from the gardener service.

Mix poisons, dusts, soils, and fungicides.

Hose walks and drives.

Remove leaves, limbs, and plants.

### Seasonal Service

Fertilize and recondition lawns and planted areas.

Aerate lawns.

Recondition equipment.

Spray, stake, cultivate, and prune.

## Comparison of Contract Services vs. In-House Work Force

Having determined the type and frequency of specific services to be performed, it was then necessary to make a decision as to whether the services would be obtained from outside contractors or an in-house work force. The fifth step, then, was to identify the elements that were to be incorporated into the housekeeping program in addition to above services, regardless of the method selected.

1. A policy statement by the institution's management requiring participation of all staff members in the implementation of the housekeeping program because of its importance.
2. A statement of the basic cleaning objectives and limitations of the program.
3. A plan for staffing and financing the housekeeping activity.
4. Provision for training personnel which will result in higher productivity.
5. Provision for the proper supplies, tools, and equipment including mechanized equipment.
6. A planned preventive cleaning maintenance program including special cleaning projects.

## Contract Services

The sixth step was to describe the advantages and disadvantages of contract services for SWRL.

### Advantages

1. The cost of housekeeping services can be significantly less where contractors' salary expenditures are lower because of their ability to utilize supervisory personnel on several contracts.
2. Capital investment and replacement costs of housekeeping equipment can be avoided.
3. The use of contract cleaners may avoid the necessity of the institution's negotiating union salary and working conditions.
4. Hazardous jobs such as outside window cleaning, overhead cleaning, and other special jobs may be avoided for regular staff cleaning personnel.
5. Seasonal cleaning jobs may be performed without adding permanent staff to the work force.
6. Administrative personnel do not have to be concerned with the day to day problems involved in a housekeeping program.
7. A cleaning contract can provide a fixed-dollar figure for budgeting purposes.

### Disadvantages

1. With some contractors, the quality of cleaning tends to deteriorate because it is directly related to their costs and profits.
2. Direct accountability and management control are lessened because the personnel performing the services are not a part of the institution.
3. Flexibility in meeting day to day conditions may be lost because of contract stipulations and the cost of providing extra service.
4. Contract personnel may not be sufficiently security conscious to meet the institution's requirements.

5. The preparation of satisfactory bidding documents and contracts to obtain the services from reputable cleaning firms is complex and difficult.

6. Interdepartment liaison and cooperation in meeting institutional housekeeping objectives become more difficult.

7. A change in contractors disrupts the continuity of services and routines that were worked out with previous contractors.

## In-House Services

The seventh step was to identify the advantages and disadvantages of providing the services with the institution's own forces.

### Advantages

1. The housekeeping function can be established on a more economical and satisfactory basis when the institution's management takes an active and personal interest in the performance of the employees providing the services.

2. Housekeeping functions can be controlled more effectively by the organization's own personnel.

3. The quality of housekeeping can be raised significantly by showing employees of the institution that they are contributing to the R&D program by providing a high level of services.

4. Management can control indirect costs and the quality of materials used more easily.

5. Related services, in addition to the regular housekeeping functions, can be provided to meet day to day needs.

### Disadvantages

1. Housekeeping costs will be significantly higher if the institution's management considers the function unimportant and allows the facility's condition to deteriorate.

2. The assignment of unskilled employees to housekeeping tasks will result in unacceptable physical conditions.

3. Capital outlay for new equipment and replacement can be costly.

4. Personnel problem resulting from turnover, absenteeism, and low morale on the part of unskilled employees can be time consuming and costly.

5. Housekeeping programs are systematically reduced in periods of budget trimming often with undesirable results accruing over a longer term.

## Comparative Costs

The eighth step is to compare the direct costs of the above two methods of acquiring custodial and grounds maintenance services. Inviting competitive bids is the most accurate way of determining the costs of contract service (Attachment 58). However, this method involves the expense of the bid preparation and issuance by the institution as well as the costs of estimating and bid submission on the part of the bidders. It would be a poor public relations practice to invite bids merely for the purpose of estimating costs. A preferable method is to utilize a consultant to gather pertinent data in a form similar to Tables 1, 2 and 3. And the institution can utilize public surveys of the salaries paid by industrial firms to employees performing custodial and gardening services to determine the approximate costs of providing the services with its own employees. The data resulting from such an effort could be arrayed as shown in Tables 4 and 5. To this would be the costs of the necessary equipment and supplies (see for example Tables 6 and 7) and window cleaning which would probably be contracted out even with an in-house custodial and gardening work force.

## Conclusion

The decision between building an in-house maintenance capability or using outside contractors should not be based solely on the comparison of direct costs. Of great importance are the relative advantages and disadvantages of the two methods of acquiring the services, all of which have indirect cost consequences that cannot be easily quantified. Indeed, the costs of quantifying the other considerations could quickly exceed any differences in direct costs. In SWRL's case, the estimated direct cost of contract services was approximately $3,000 a year above that of in-house. SWRL's initial decision, then, was to utilize contract services because of the advantages set forth above. To date, contract service has been very satisfactory because of the quality of performance of the present contractors.

## Table 1

Custodial - Based on Existing Union Contract Agreements

| Classification | Hours Per Day | Hours Per Week | Hours Per Month | Hourly Rate | Total Per Month |
|---|---|---|---|---|---|
| Foreman (1) | 8 | 40 | 174 | $_____ | $________ |
| Janitor (5) | 40 | 200 | 870 | $_____ | ________ |
| Total Labor | | | | | $________ |
| Overhead, Supervision, and Fee - __% of labor | | | | | ________ |
| Payroll Taxes - __% of labor | | | | | ________ |
| Insurance - __% of labor | | | | | ________ |
| Health and Welfare - $________ per month per employee | | | | | ________ |
| Pension - __¢ per hour | | | | | ________ |
| Vacation and Sick Leave - ______% of labor | | | | | ________ |
| TOTAL PER MONTH | | | | | $________ |
| TOTAL PER YEAR | | | | | $________ |

Table 2

Gardening and Grounds Maintenance - Based on Public Survey of Union Contracts

| Classification | Hours Per Day | Hours Per Week | Hours Per Month | Hourly Rate | Total Per Month |
|---|---|---|---|---|---|
| Foreman (1) | 8 | 40 | 174 | $_____ | $_______ |
| Gardener (2) | 16 | 80 | 348 | $_____ | _______ |
| Total Labor | | | | | $_______ |
| Overhead, Supervision, and Fee - __% of labor | | | | | _______ |
| *Employee Benefits - __% of labor | | | | | _______ |
| TOTAL PER MONTH | | | | | $_______ |
| TOTAL PER YEAR | | | | | $_______ |

*There are very few private firms doing contract gardening that are unionized. Most firms are made up of individuals and family groups.

## Table 3

Window Cleaning - Based on Union Contract Rates

| | Cost Per Hour | Cost Per Wash |
|---|---|---|
| Labor Cost | $______ | |
| Vacation - ____ days<br>Holidays - ____ days<br>Sick Leave - ____ days | | |
| __/___ = __% | ______ | |
| Total Labor Cost | $______ | |
| Overhead, Supervision, and Fee - __% | ______ | |
| Payroll Taxes - ___% of labor | ______ | |
| Insurance - ____% of labor | ______ | |
| Health and Welfare - ____¢ per hour | ______ | |
| Pension - ___¢ per hour | ______ | |
| Supplies - ___¢ per hour | ______ | |
| Total Cost Per Hour | $______ | |
| TOTAL COST PER WASH<br>(___ hours x $____) | | $______ |
| TOTAL COST PER YEAR<br>($______ x __) | | $______ |

## Table 4

Custodial - Based on Public Surveys of Salaries Paid by Private Firms

| Classification | Hours Per Day | Hours Per Week | Hours Per Month | Hourly Rate | Total Per Month |
|---|---|---|---|---|---|
| Building and Grounds Supervisor (1) | 8 | 40 | 174 | $____ | $____ |
| Custodian (5) | 40 | 200 | 870 | $____ | ____ |
| Total Labor | | | | | $____ |
| Employee Benefits - __% (Exclusive of Vacation and Illness) | | | | | ____ |
| TOTAL PER MONTH | | | | | $____ |
| TOTAL PER YEAR | | | | | $____ |

## Table 5

Gardening and Grounds Maintenance - Based on Public Surveys of Salaries Paid by Private Firms

| Classification | Hours Per Day | Hours Per Week | Hours Per Month | Hourly Rate | Total Per Month |
|---|---|---|---|---|---|
| Senior Gardener (1) | 8 | 40 | 174 | $_____ | $________ |
| Gardener (2) | 16 | 80 | 348 | $_____ | ________ |
| Total Labor | | | | | $________ |
| Employee Benefits - __% (Exclusive of Vacation and Illness) | | | | | ________ |
| TOTAL PER MONTH | | | | | $________ |
| TOTAL PER YEAR | | | | | $________ |

## Table 6

## EQUIPMENT AND SUPPLIES - CUSTODIAL

| TYPE | ESTIMATED COST |
|---|---|
| **Custodial Equipment** | |
| Vacuum Cleaners | |
| 20" Upright, 4 @ ____________ | $________ |
| 12" Upright, 1 @ ____________ | ________ |
| Wet & Dry Pick Up, 1 @ ____________ | ________ |
| Tank Type, Light, 2 @ ____________ | ________ |
| Pile Lifter, 1 @ ____________ | ________ |
| Scrub Machines | |
| Dry Foam Carpet Shampooer, 1 @ ____________ | ________ |
| Floor Machine, 18", 1 @ ____________ | ________ |
| Ladders | |
| 4' Aluminum, Step, 2 @ ____________ | ________ |
| 6' Aluminum, Step, 2 @ ____________ | ________ |
| 8' Aluminum, Step, 2 @ ____________ | ________ |
| 10' Aluminum, Step, 1 @ ____________ | ________ |
| 12' Wood, Extension, 1 @ ____________ | ________ |
| 24' Wood, Extension, 1 @ ____________ | ________ |
| Scaffold Plank Aluminum, 16', 1 @ ____________ | ________ |
| Trucks | |
| Dolly, 4 Wheeled, Solid Platform, 2 @ ____________ | ________ |
| Truck, 2 Wheeled, Hand, 4 @ ____________ | ________ |
| Total | $________ |
| **Custodial Supplies** | |
| Paper Towels & Sanitary Supplies | $________ |
| Other | ________ |
| Total | $________ |

## Table 7

## EQUIPMENT AND SUPPLIES - GARDENING

| TYPE | ESTIMATED COST |
|---|---|
| **Grounds Equipment** | |
| Power Sweeper, 42", Self-propelled, 1 @ ____________ | $ |
| Tractor, 4 Cylinder, General Purpose, With 2 Wheeled Trailer, 1 @ ____________ | |
| Mowers | |
| 76" Power Gang, With Sulky, 1 @ ____________ | |
| 30" Power, With Sulky, 1 @ ____________ | |
| 25" Power, 1 @ ____________ | |
| Edger, Power, 1 @ ____________ | |
| Miscellaneous | |
| Sprayer, 25 Gal., Power, 1 @ ____________ | |
| Sprayer, 3 Gal., Hand, 2 @ ____________ | |
| Spreader, Lawn, Dry Fertilizer, 1 @ ____________ | |
| Wheelbarrow, 4 Cu. Ft., Metal, 2 @ ____________ | |
| Trimmer, Tree, Pole, 1 @ ____________ | |
| Hand Tools as required | |
| Total | $ |
| **Grounds Supplies** | |
| Insecticides | |
| Other (See Contract Grounds Specifications) | |
| Total | $ |

## Working Paper 11

# OPERATING A FACILITY DEDICATED EXCLUSIVELY TO EDUCATIONAL RESEARCH AND DEVELOPMENT (TN 1-74-01)

Robert L. Christensen

SWRL Educational Research and Development accepted and moved into its new facility in May 1972. Since that time it has engaged in continuing efforts to refine the procedures associated with the day to day operations of the facility. The objective is to install and maintain the institution's educational R and D program in the new facility in the most efficient and effective manner. Preliminary results of the studies currently being conducted by the SWRL Administrative Services unit are summarized under the following seven rubrics: security, energy consumption, operating costs, risk management, food services, telephone system, and clerical support services.

## Security

The architectural design of the SWRL facility was planned to be as open as possible while adequately protecting the privacy of individual staff members. Consistent with this functional design, the courtyard, office landscaped areas, and work areas are integrated with enclosed office and special purpose areas. While the facility is dedicated exclusively to educational R&D, the fact that it is the first such facility ever constructed for this purpose insures a high volume of visitors. To maintain a maximally open facility for both staff and visitors while protecting the individual privacy of staff, as well as the personal and public property within the facility, requires careful attention to insuring effective techniques in the following areas:

- Identification of all persons entering and exiting the facility.
- Providing guidance for visitors moving from one area to another within the building.
- Controlling the removal/return of SWRL equipment used in field projects.
- Providing an early warning system for forced entry.
- Making the facility available to SWRL Staff during off-hours without compromising overall security.

SWRL has implemented various security practices and procedures which have proved to be effective. They are described below.

## Hours of Access

Security problems can be significantly reduced by controlling the times that staff members have free access to the facility. This is particularly important during non-working hours such as in the evening and during the weekend. The hours that the facility will be open should be determined in accordance with the requirements of the organization's work program. As a result, a balance must be achieved so that staff members have sufficient access to the facility during non-working hours in order to complete priority projects. At the same time, it is an accepted fact that security is most vulnerable when the facility is open during non-working hours and a single guard must perform all security functions. It is, therefore, extremely important to have guard personnel who are reliable and trustworthy. SWRL is currently using a schedule for the building which seems to satisfy most requirements. The hours are:

| | |
|---|---|
| Monday - Friday | 7:00 A.M. to 11:00 P.M. |
| Saturday & Sunday | 9:00 A.M. to 4:00 P.M. |

The building is not available to any staff members at times other than those indicated in the absence of special arrangements made in advance and approved by the Directorate.

### Entrances

Security precautions are effective only if all access points into the building are controlled. The SWRL facility has four controlled entrance - exits. The first is the main entrance in the front of the building which must be used by all staff and visitors. It is controlled by a receptionist. The second is the children's reception entrance, on one side of the building. It is used only in accessing the simulation area and is also controlled by a receptionist when the area is in use. The third is the shipping - receiving entrance, on the other side of the building adjoining the parking lot. As the name implies, it is used only for receiving and sending materials. The fourth type includes all other exits which are for emergency exit use only. The latter exits are electronically monitored by the receptionist at the main entrance at all times, including working hours.

### Individual Identification

Access by any person to the facility is permitted only while wearing a visible personal name identification. All staff members are issued permanent badges with their names; these must be worn at all times while in the facility. Temporary badges are issued to temporary staff members or permanent employees who are awaiting a permanent badge, or have misplaced the badge that was originally assigned to them.

After signing the guest register, guests are issued a visitor's identification badge by the receptionist. The visitor's badge number is coded to the log that indicates the guest's name and the staff members hosting the visit. All guests are escorted by a staff member to and from the location they are visiting within the building. The staff member receiving the visitor is responsible for accompanying the visitor at all times while in the building.

## Special Purpose Areas

Staff members are permitted full access to all areas within the building. When an activity (e.g., recording, filming, etc.) is in progress in a special purpose area that should not be interrupted, this condition is indicated by a sign at the area entrance. For purposes of safety, equipment operated by technical support personnel (e.g., print shop) is accessed by transmitting a request for the work involved to the responsible support staff by courier. The special purpose areas are secured on an individual basis at the end of each work day.

## Children's Areas

Children participating in SWRL activities are required, by State fire regulations, to remain within the simulation area. By SWRL policy they must also be under the direct supervision of their parents, a teacher, or a SWRL staff member at all times. Parents and other adults accompanying the children must follow the usual procedures and obtain visitors badges from the receptionist at the main entrance if they wish to visit the facility beyond the simulation area.

## Controlling the Removal/Return of SWRL Equipment Used in Field Tryouts

SWRL's property control practices require that each item of equipment used in a field tryout be checked out to a staff member who is responsible for its safekeeping and return. The staff member must complete the usual form and obtain the necessary signature approvals. A copy of the form is received by the property custodian who records the removal of the equipment in his records. Additionally, the person removing the item(s) must present an approved removal receipt to the receptionist. The property custodian signs the removal receipt upon the return of the property and clears the control record.

## Early Warning System for Forced Entry

During those periods in which the facility is unoccupied, an ultrasonic alarm system is utilized to detect any unlawful entry. The system has been specifically engineered to reflect the type of flexibility which is needed in an R&D facility. For example, the building is divided into seven (7) areas which represent the major independent work spaces within the facility. Each area contains its own network of ultra-sonic sending & receiving units. Signals from each network are transmitted via telephone lines to an alarm panel which is monitored by a central station alarm company. With this type of system, an area of the facility will be made available to staff members during non-working hours by their deactivating only the zone in which they will be working. The other zones would remain "on-stream" and will detect and transmit any motion from an intrusion. This would permit part of the building to be available to staff members and at the same time not require the presence of a security guard. To date, it has been deemed advisable to have a guard in the building whenever it is open.

Another advantage of a zoned system is that an intruder can be tracked by the guard service as he moves from one zone to another. This would be very helpful in apprehending an individual in the building since it has numerous exit points.

## Energy Consumption

The Administrative Services staff has been engaged in a continuing study to identify the optimal operating configuration of the facility's heating, ventilating, lighting, and air conditioning systems. The data required to make this determination will be the result of investigations currently under way in the following areas:

(1) Effects of increased line capacitance on a power factor of less than unity.

(2) Relationship between outside air availability and chiller load at various external temperatures.

(3) Use of computer-based remote heating/cooling operating systems.

(4) Effect of external radiant energy filters.

The advent of the energy crisis has intensified the need to translate the preliminary findings of the above inquiries into operating procedures. By applying the knowledge obtained to-date, SWRL has been able to decrease its power consumption by more than 25 per cent.

It is anticipated that further refinement of the data being collected will provide the basis for recommending an optimal operating configuration for a facility totally dedicated to R&D in education.

## Operating Costs-Lease vs. Purchase of Contractor Facility

There are several alternatives which a performing contractor for educational R and D may consider in acquiring housing for its activities. A prime, but not exclusive, factor in making the decision is the matter of relative costs of operations of the various alternatives. The usual choice is between leased premises and a grant for construction or acquisition of a facility. The preliminary results of the study being conducted to analyze SWRL experience are as follows.

Costs are shown for a 90,000 square foot R and D facility for (1) year.

| CATEGORY | LEASED FACILITY | OWNED FACILITY |
|---|---|---|
| Electricity | INCL. | $53,000 |
| Gas | " | 6,000 |
| Water | " | 4,000 |
| Building Maintenance | " | 53,000 |
| Maintenance Supplies | " | 24,000 |
| Fire/Intrusion System | " | 4,600 |
| Insurance | " | 12,000 |
| Building Management | " | 15,000 |
| Lease Payment | $650,000 | 0.00 |
| Total | $650,000 | $150,000 |

Thus, a performing contractor holding title to its facility can devote considerably more program operations funds to its R and D activities at the same level of funding than would be possible in leased quarters.

## Risk Management

Risk management by a performing contractor is a necessary element in achieving a stable operating facility configuration. Any organization must assure its continued viability by controlling its exposure to unexpected losses. With a totally dedicated facility, the risk of unexpected loss is significantly higher than a shared facility where the owner/lessor assumes much of the risk exposure. A risk management program must go beyond the traditional insurance acquisition program. The latter is merely a tool of the risk manager and should be applied very judiciously. The elements of a total program, therefore, should consist of: identifying exposures to loss; eliminating or minimizing those exposures where possible; and providing the mechanism for absorbing losses which cannot be prevented.

### Exposure To Loss

The exposure to loss is extensive in any endeavor of significant size. The scope ranges from improperly installed sidewalks, slippery floors, torn carpeting, etc. to more sophisticated risks such as alleged copyright violations and hold-harmless agreements. An effective program requires that all decision-makers be sensitive to loss-exposure recognition since they set the boundaries of exposure. For example a print shop supervisor who is installing a new piece of equipment will have to decide how much training the operator will require in order to operate it safely.

Avoiding losses is important if the operations of an R and D facility are to remain uninterrupted and the goals of the organization are to be achieved. It is the responsibility of the institution's risk manager to establish the framework for the organization's risk management program. Generally, loss exposure can be classified under three general headings: property, income and legal liability.

## Property

With regard to loss of property, the risk manager should determine exposure by continually examining the institution's operations for the susceptability to fire and theft. The following checklists have been developed to assist in this process at SWRL.

### Fire Exposure

- what types of solvents are being used and under what conditions?
- are hazardous operations separated from non-hazardous?
- are fumes and dust removed from the working environment?
- is housekeeping satisfactory?
- are firefighting systems suited for the type of equipment they are protecting? Consider $CO_2$ or dry means of controlling fire when exposure is to electronic equipment?
- is the fire alarm system adequate?

## Theft Exposure

- is sensitive equipment kept in a secure area or checked out to specific individuals?
- are high value items under the control of a specific manager?
- is there an adequate system for detecting forced entry?
- is the forced entry alarm system connected to a central station?

As other items or questions are identified that are unique to a fully committed R&D facility they will be added to the above.

## Loss of Income

The consequences that result from destruction or loss of property include potential loss of income. In the event of loss of facility and equipment, it would be difficult, if not impossible, to continue operations because funding might cease until suitable facilities and necessary equipment were made available. Thus the elimination of exposure to loss of property will limit exposure to loss of income for a performing contractor of educational R&D.

## Legal Liabilities

In many instances, the exposure to legal liabilities is not readily apparent. It depends on the type and nature of the R&D activities of the performing contractor and extends beyond the normal automobile liability or industrial safety considerations. The risk could, for example, be embedded in contractual agreements or it may arise from employee dishonesty.

## Transferring the Risk

In most instances, a performing contractor in education R and D which is totally dependent on Government funding is limited as to the amount of self-insuring possible against unexpected losses. Funding agencies rarely will allow a contractor to include a reserve or contingency in the negotiated budget to cover such items. Such a contractor can, however, obtain funding for investment in specific loss prevention programs. This could include upgrading a building sprinkler system, installing a more effective intrusion/fire alarm system, or eliminating potential safety hazard found in a shop area. However, there will still be a need to provide a method for absorbing unexpected losses which cannot be accommodated within the normal operating budget. Generally, this is accomplished through the use of insurance. A comprehensive insurance program for a non-profit, government-supported performing R and D contractor, is shown in Figure 1. Of course, it is recognized that any insurance program must be tailored to reflect the overall strategies of the risk management program.

## Food Services

The management of the food services function can have a significant impact on achieving an optimum operating configuration. Some organizations spend an inordinate amount of time trying to solve problems which continually arise in this area. From the employees' standpoint, an institution sponsored food service program is viewed as a fringe benefit to which they are entitled. As such, there is oftentimes a feeling that past improvements

| TYPE OF INSURANCE | SUBJECT ON LOCATION | PROPERTY OR INTEREST | LIMITS |
|---|---|---|---|
| Comprehensive General Liability | Premises operation including products, contractual, personal injury, owned and non-owned autos | Bodily injury<br>Property Damage<br>Medical Payments<br>Uninsured Motorist<br>Comprehensive<br>Collision | $300/500<br>$100,000<br>$5,000<br>$15/30,000<br>Actual Cash Value |
| Excess Blanket Liability | All Operations | Bodily Injury, Personal Injury, and Property Damage | $10,000,000 |
| Commercial Property "All Risk" | Facility | Building<br>Sprinkler Leakage<br>Earthquake Sprinkler Leakage<br>Plate Glass | $2,949,000<br>$ 738,000<br>$ 738,000<br>As scheduled |
| Fire, Extended Coverage, Earthquake Damage Assumption | Facility | Office Equipment | $1,300,000 |
| Commercial property "All Risk" | Facility | Office Equipment | $1,300,000 |
| Boiler & Machinery | Facility | As Scheduled | $5,000,000 or accident |
| Travel Accident | Staff Members | Principal Sum<br>Employee Aggregate for Accident | $100,000<br>$600,000 |
| Faithful Performance Blanket Bond | Laboratory | Public Employees | $500,000 |
| Dishonesty, Disappearance | Laboratory | On warrants issued by U.S.<br>Loss Inside Premise<br>Loss Outside Premise<br>Money Orders, Counterfeit & Paper Currency<br>Deposition Forgery Coverage | <br>$250<br>$250<br>$1,000<br>$100,000 |

are insufficient; the quality of the food is low; the service is bad; and the prices charged are too high. The larger operation will invariably result in larger problems. Since the basic type of food service provided can influence the type of future problems which will be encountered, SWRL studied various alternatives before deciding what type of program would be most suitable for a totally-dedicated R and D facility. These alternatives included the following.

- full-service cafeteria
- vending machines
- catering truck
- snack bar - operated by handicapped person

The findings of the studies indicate that the full-service cafeteria would have required a large allocation of prime space and investment of capital and would have consumed considerable management time. Moreover, employees using the cafeteria would not have been pleased with the quality of the operation or the cost. No overriding advantages for full-service cafeteria were disclosed in the study that would have overcome these disadvantages.

For SWRL, a vending machine operation would have limited the types of foods that could be made available to employees. It also had the same disadvantages as the full-service cafeteria. That is, the employees would not have been satisfied with the quality or price of the food. Moreover, vending machines inevitably break down during their periods of highest use and would have required a skilled mechanic on hand to repair them.

Catering trucks probably represent the least desirable choice among those alternatives mentioned for an educational R and D institution in a totally-dedicated facility. In addition to offering low quality food at a relatively high price, the employees must leave the facility to make their purchases. This prolongs break periods because of the necessity for employees to stand in line. It also makes the institution's operating schedule dependent on that of the catering truck. The single advantage is that no investment is required.

For an institution such as SWRL, the optimum arrangement for satisfying food service requirements is the establishment of a snack bar sponsored by a State Department of Rehabilitation. These snack bars are operated by handicapped persons and offer many advantages. These include:

- All training is provided for the operator;
- All equipment and fixtures are provided at no expense to the institution;
- The State maintains all supplied equipment;
- Operator is considered an independent businessman and receives little to no subsidy from the institution.

Experience has shown that the employee will be relatively satisfied with this arrangement. Few complaints have been made to the handicapped operator or to the institution. Thus little management time is expended in responding to staff complaints. Moreover, the snack bar requires little floor space leaving more space for R&D activities than would be available if a cafeteria were being supported.

## Telephone System

The final design of a totally-committed educational R&D facility will establish certain parameters for the type of internal and external voice communication system which will be required. Because the needs of the various groups of individuals making-up the organization vary greatly, a substantial amount of phone system analysis is required in order to attain an optimal configuration. These studies must take place after the facility has been occupied for a period of time and operations have reached a steady - state condition.

The initial planning considerations for a phone system generally include the items listed below. These points will have to be addressed prior to the ordering of the hardware from the telephone company. Thus, the capabilities of the system will be somewhat fixed before any operating data can be collected. However, in most instances this will not be a problem since the broad characteristics of the system can be determined from the institution's past experience.

The general hardware specifications can be formulated from inquiry in the following areas:

(1) Incoming Calls

Are all calls to be answered from a central point?
What type of line identification display is required?
Does the operator need to know what lines are in use?
What should the ultimate capacity of the selected system be in order to meet projected growth?

(2) Outgoing Calls

Will only specified stations have the capability of dialing outgoing calls to the local exchange or to toll networks without operator assistance?

How many outgoing trunks will be needed to handle all traffic with minimum delay?

How much delay is acceptable?

(3) Internal Calls

What will the volume of internal calls be?

Do the station users need to have the capability call one another throughout the facility operation assistance?

Do all persons need a phone at their work station?

(4) Transfer of Calls

Should station users have the capability of transferring incoming calls without operator assistance?

(5) Attendant Position Capabilities

What type of capability is required for extending calls?

Will incoming calls need to be held?

What are the attendant break in requirements?

Is automatic recall desirable?

(6) Station Capabilities

Is station to station dialing desirable?

Is direct outward dialing from station desirable or necessary?

Station controlled transfer?

Restriction of station?

After the communications hardware has been selected, analysis should be undertaken to determine the telephone requirements of the individuals in the organization. These persons may be divided into the following groups according to calling patterns:

(1) Light usage with majority of calls station-to-station

(2) Heavy usage from incoming calls

(3) Heavy usage from outgoing calls

(4) Heavy usage from incoming and outgoing calls.

Generally, most of the staff members in an educational R&D facility have light phone requirements. The studies in SWRL showed that a single instrument for each office, connected directly to the main switchboard, will satisfy all requirements. Calls can easily be transferred, when necessary, and message centers can be set-up to take calls when the staff member is not in his office.

Persons in the organization who make and/or receive numerous calls, such as in a liaison function, can utilize a "call commander" system to provide added capability. This system allows a secretary to receive all calls coming into the group and then redirect them to the appropriate party. She also acts as a message center for the persons connected to the "call commander." This can be an efficient arrangement depending on the importance of the calls being handled.

Persons who place numerous calls to the outside such as in a purchasing office, may find that a direct line which bypasses the switchboard may be most efficient. This will depend on the outside trunk usage frequency.

If the trunks are continuously busy it may not be practical to try to access them for heavy outside calling.

SWRL's continuing study of the factors which influence the design of a communications system will help determine the most cost-effective system possible at any particular time.

## Clerical Support Services

### Organization

The internal office configuration of the SWRL facility is a derivative of the open office landscaping concept. It integrates the most desirable features of a closed office arrangement with the benefits of open office landscaping. This was achieved by dividing the office space area into modular units. Each module consists of a number of small staff offices clustered around a large open work area and a secretarial area. The work areas are considered an extension of the enclosed office space and are used for meetings or for the layout of program materials. The secretarial areas are located along the building corridors to provide a measure of commonality, yet supportive to the offices included in the module. This type of configuration provides the maximum flexibility in selecting the type of clerical support organization which best meets the needs of an educational R&D organization.

Clerical organization studies have been ongoing since moving into the new facility. Initially, it was decided to retain the same clerical structure that was being used in the old facilities. This was the conventional arrangement in which a clerk-typist is assigned to support a certain group of staff members. The disadvantage of this system, of course, is that the clerk-typist invariably becomes dedicated to supporting only staff she is assigned to. The clerk is never available to provide needed assistance elsewhere.

With an office configuration which lends itself to a "pool type" clerical organization, SWRL initiated a study of the effect this type of structure would have on the productivity of the clerical staff. It was necessary to first define for the SWRL professional staff those secretarial services that would be provided and the prioritization of these tasks. It was anticipated that many of the deficiencies of the old organization would be eliminated. Consequently, all clerical personnel were assigned to one of three "pools," each headed by a Secretarial Task Coordinator. All work to be done by the pool would be accepted by the Secretarial Task Coordinator and she, in turn, would assign it to the clerk-typist. In this way work priorities established by SWRL management could be fulfilled with fewer problems in assigning resources.

The success of this system is apparent after examining the ratio of the number of professional staff to the number of required clerical staff:

| YEAR | PROF. STAFF/CLERICAL RATIO |
|---|---|
| 1972 (non pool) | 3.8 |
| 1973 (pool) | 4.3 |

Of significance when looking at the data is the fact that the total clerical load for distribution, if anything, increased slightly in 1973.

Continuing studies in the area will determine if increased productivity is being obtained through further refinements in the clerical organization structure as for example expanded use of part-time and on-call clerks to handle temporary peaks of clerical tasks.

## Effect of Hardware Support

A study has been made of the effects of hardware support of the clerical staff in the new facility. As a first effort, SWRL has been utilizing three magnetic/card selectric typewriters in an attempt to ascertain whether the overall productivity of the clerical staff is increased. It has been found that these machines are extremely efficient for preparation and maintenance of address lists, phone lists, personnel lists, etc., and the revision of large technical reports. However, it has also been found that the potential capability of such devices can only be exploited only if the clerical staff accepts their utility and views them as a better means of accomplishing their clerical assignments. Without such a perspective, the machines will not be effectively utilized.

The factors isolated to date which appear to affect the use of the MC/ST's are:

- Physical location
- Organizational unit to which the machine is assigned
- Degree of training and/or exposure of clerical staff to its operating characteristics

The physical location is important from the standpoint that the user must feel that she has convenient access. If the device is located too far away from her main working location, there is a probability that she will not use it even though the overall time savings for her would be significant. Thus, selecting locations in the facility requires adequate consideration.

The organizational unit to which responsibility for the machine is assigned is also extremely important. Even with a "pool" type secretarial organization, there is an inclination for those who may not readily identify with such unit to avoid the machine's use because "it belongs to someone else." As a result, it is most successful to assign the machines to "neutral" groups or, if feasible, a clerical sub-pool. Most importantly, the machines should not be assigned to specific operators.

## Continuity of Secretarial Training

SWRL has been studying the affects of formalized on-the-job training for entry-level clerks joining the organization. The establishment of a program of this type was made possible when SWRL adopted a "pool" type clerical organization. This permitted new clerical employees to be assigned to a central sub-pool for intensive training in the procedures and practices that are common throughout SWRL. Upon completing the program, these clerks have had an exposure to most of the activities within the total organization and are capable of being assigned to any task within any division. Specific topics covered during training:

- Typing format and style
- Grammar, punctuation, spelling and SWRL terminology
- General office practices and procedures
- Telephone techniques
- Secretarial etiquette and office conduct
- Keypunching

The most significant measure of the effectiveness of the training program is the job performance of those who "graduate." These persons can be compared with clerks who were hired prior to the implementation of the program and received only informal training. The results to-date show that the staff members who have completed the program tend to be more versatile, more productive, and more knowledgeable of SWRL's activities, than those who have not participated. And, as would be expected, those who have had the benefit of training are achieving promotions more rapidly than the others. Continuing studies will now concentrate on determining the types of retraining that would be effective after a specified period of employment at SWRL has been completed.

## Working Paper 12

## PLANNING, PROCUREMENT, INSTALLATION AND MAINTENANCE OF EDUCATIONAL R&D EQUIPMENT AND EQUIPMENT SYSTEMS IN A NEW FACILITY (TN 1-75-05)

William H. Hein, Jr.

SWRL Educational Research and Development was awarded a grant from USOE to construct and equip a new facility to be used exclusively for educational R&D. Funds were provided for the procurement of R&D equipment and equipment systems up to a maximum of $577,000 necessary to conduct the R&D activities set forth in the approved five-year program plan. The R&D systems to be purchased with grant funds included a studio television system, studio lighting system, audio system for conference room and an instructional development control and monitoring system (IDCMS). The R&D equipment included items for film and still photography, audio recording, wood and metal shop, instrumentation laboratory, and microform. SWRL staff, with consulting assistance, had analyzed future program requirements and determined that these additional systems and equipment items were the minimum necessary to accomplish the mission approved by the Federal Government.

### Specialized Facility Specifications

It was essential to insure that the necessary physical features to accommodate the R&D equipment systems and groups were incorporated into the architect's plans and specifications for construction of the facility proper at the earliest possible time. This included making provision for the equipment to be purchased under the grant as well as the items to be acquired from other funding sources immediately and in the future. A consultant was, therefore, retained early in the planning stage of the facility to prepare architectural and engineering criteria to be utilized by the architect in the preparation of the plans and specifications based on the consultant's analysis of SWRL's future equipment requirements. The consultant devoted his main efforts to those "special purpose areas" described below since these spaces would house the R&D equipment systems and groups. Moreover, since these "special purpose areas" would constitute the most expensive and least flexible portions of the new facility, economic considerations mandated that future modifications would have to be kept to a minimum.

1. research/simulation area
    a. learning labs - teletype terminal, television, earphones, television monitor camera
    b. control center - control equipment for IDCMS
    c. simulated classroom - television sets, underfloor duct networks for 30 teletype terminals
2. data processing area
    a. central processor facility - data processing unit and IDCMS system
    b. area-teletype terminals
    c. CRT terminal area - CRT terminals
3. A-V production area
    a. A-V production studio - color video tape system, studio lighting system
    b. audio production studio - audio recording equipment
    c. A-V control room - electronic control equipment for A-V production studio

4. film production area - film editing equipment
5. production support area
    a. photo lab - darkroom equipment
    b. print shop - platemakers, presses, bindery equipment
6. shop area
    a. electronic/lab - electronic test and assembly equipment
    b. wood and metal shop - lathes, saws, grinders, drill press, etc.
7. library - microform equipment
8. conference area - sound system
    a. projection - film and slide projection equipment

The consultant's report described the desired environmental and physical features for the above specialized spaces in a form understandable by the architect and his engineers (Attachment 59). As a result, the initial building design did in fact incorporate all necessary features to accommodate the equipment systems and groups to be purchased under the grant, as well as items already owned or to be purchased in the future. This eliminated, for all practical purposes, the necessity for facility modifications after construction commenced or was completed.

## Specifications

SWRL's construction grant provided for the purchase of approximately $577,000 of R&D equipment systems and groups. These had been described in general terms only in the proposal. Following grant award, a consultant was retained to work with SWRL management and staff in the preparation of a set of detailed specifications for the approved items.

The specifications for the R&D equipment systems set forth the functional and performance requirements of each recommended component (Attachment 60) as well as each system as a whole (Attachment 61). In addition, they were in a format that permitted their use in RFP's in the procurement process described below. Their provisions permitted firms responding to RFP's to propose the substitution of components other than those recommended so long as the substituted components were equal and the total system would still meet specified performance requirements. This had the desired effect of increasing competition and making provision for any new technological developments in hardware unknown to SWRL staff or its consultant at the time of specification preparation. The specifications also provided for final system acceptance tests to be made by the contractors in the presence of SWRL technical staff and consulting engineers after installation in the new facility (Attachment 62).

## USOE Review

SWRL's grant provided for a review by USOE staff and consultants of the request for equipment separate from that for the facility proper. SWRL furnished copies of its approved Five-Year Program Plan; Specialized Facility Specifications, Systems and Equipment Specifications; most recent Contractor's Request for Continued Funding (detailed account of then current SWRL operations); and Systems/Equipment Procurement, Inspection and Maintenance Specifications, for preliminary examination by USOE staff and its consultants. Following their review of over 1,500 pages of written materials and electronic diagrams, a meeting was held at which SWRL staff and consultants made presentations and answered the questions of USOE staff and consultant reviewers.

The following pre-specified criteria was used by USOE in reviewing SWRL's equipment request:

"1. essentiality of systems' functions to the execution of approved SWRL program plans;

2. cost-effectiveness of systems' characteristics, as specified

3. credibility of systems' acquisition costs, as estimated;

4. credibility of systems' activation and operations/maintenance requirements, as enumerated and costed;

5. acceptability of systems' activitation and operations/maintenance costs, if charged to annual contract;

6. adequacy of systems' modifications for competitive procurement;

7. cost-effectiveness of proposed procurement strategy, i.e., purchase rather than lease; and

8. conformance with Federal computer procurement regulations, where applicable, to include consideration of criteria 2, 3, 4, 6, and 7 relative to any computer hardware."

The review panel held a caucus with the USOE Project Officer at the close of the meeting and recommended approval of the SWRL request. Their oral advice was confirmed in writing to the Project Officer shortly thereafter. This expedited the review process considerably and enabled SWRL representatives to make many of the changes requested by USOE in advance of their receipt of the Project Officer's written notice of approval.

SWRL also submitted a request for additional administrative equipment to be funded from the grant (Attachment 63). Subsequently it was decided to fund these items from non-grant sources.

## Procurement, Installation and Maintenance Plan

USOE's review process included the examination of SWRL's implementation plan which was presented in the form of a document entitled System/Equipment Procurement, Installation and Maintenance Specifications. Generally it set forth the procurement, installation and maintenance requirements for the R&D systems and support equipment to be purchased under the grant, described the requirements for specialized staff members who would be required to operate and maintain the equipment and contained a schedule coordinating the equipment activities with the construction schedule for the new facility.

More specifically, the "implementation plan" was divided into six sections. The first set forth for each system/equipment group, a full description of the main components; functions to be performed; estimated time required for proposal or bid preparation; system contractor's anticipated in plant construction activities and schedules; site preparation; and installation and testing requirements. It also set forth the estimated cost of installation, maintenance and operation. Operation and maintenance requirements were described in terms of estimated manhours, type of personnel, and special maintenance/test equipment required. Alternative methods of performing preventive and corrective maintenance were evaluated including (a) maintenance by in-house personnel, (b) maintenance by contract with an outside agency, and (c) "on call" maintenance programs. The consultant's analysis of these alternatives indicated the cost-effective advantages of utilizing in-house personnel for both preventive and corrective maintenance.

Estimates of cost totals to be funded from the grant, based on the recommended list of components plus engineering and installation charges, were also detailed (Attachment 64).

The second section described in more detail the types of technical personnel who would be required to operate and maintain the recommended systems and equipment for R&D activities. These costs would be funded from future R&D contracts. The required personnel functions were analyzed and the findings were shown in the form of estimated personnel costs, job descriptions for the technical support personnel, and a chart depicting the percentage of time each employee would devote to the operation and maintenance of the new, as well as currently owned, R&D equipment (Attachment 65).

The third section contained a diagram of the SWRL construction schedule prepared by the construction manager and an analysis of that schedule as it would affect the site preparation, installation and final testing of the equipment system/groups. All activities that were scheduled during this "activation period" for equipment were fully described and coordinated with the construction schedule for the facility proper (Attachment 66).

The fourth section arrayed the above sequence of events using a modified version of program evaluation and review technique (PERT). This modified PERT diagram integrated the scheduled events related to procurement and installation of recommended systems/support equipment and the construction schedule for the facility. A separate event line was included for each system/equipment group and for the coordinate personnel requirements. A brief commentary on the PERT Diagram was also included (Attachment 67).

The fifth section contained a budget summary of the findings presented throughout the previous sections (Attachment 68).

The sixth section contained recommendations for SWRL management for controlling the operation and concomitant expenses of the systems/equipment, supported by specific use indicators (Attachment 69).

## Procurement of Systems

Following USOE approval, RFP's were issued for the R&D equipment systems (Attachment 70) and IFB's for the equipment groups. The RFP's made provision for a visit to the plant of each proposer submitting a responsive proposal and a discussion of the proposal with his technical personnel.

The RFP's also provided that each component of a system was to be tested in the successful contractor's plant, in the presence of SWRL staff and consultants, before shipment to SWRL.

Pre-specified criteria for contract award were set forth in the bid documents. The award of contract was based on an analysis of the proposals received by a SWRL consultant utilizing a rating schedule keyed to the pre-specified criteria (Attachment 71). By necessity, all ratings were of a somewhat subjective nature. Therefore, a thorough analysis was made by the consultant of each point for evaluation against a theoretical ideal. Weightings were assigned to each specific criterion based on its relative importance to the total system design. A cost-benefit analysis technique was then utilized to determine the maximum gain (benefit) for the specified proposed price (cost). Of the 19 criteria, 18 represented specific benefits offered by a particular system proposal. The 19th represented the total cost of the system being proposed; therefore, it was the most heavily weighted (10 out of a possible 100).

Following approval of USOE's Grants Officer (Attachment 72), contracts were awarded to the firm submitting the best proposal (Attachment 73).